

SPRING 2020

# THE POLAR TIMES

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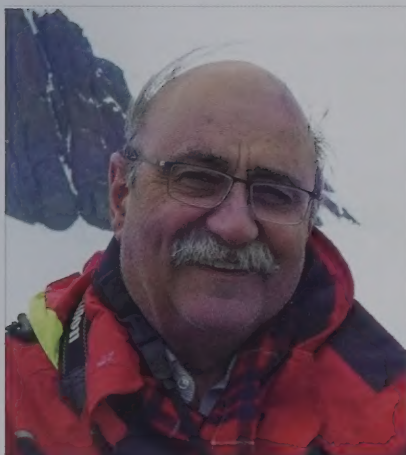
VOLUME 4, NUMBER 2 | [WWW.AMERICANPOLAR.ORG](http://WWW.AMERICANPOLAR.ORG)



Cover: Polar bear standing on summer sea ice in Arctic Bay, Nunavut, Canada. Inside front cover: Walrus resting on a beach of Devon Island in Nunavut, northern Canada, during the Arctic summer © Florian Ledoux

# ACTING PRESIDENT'S MESSAGE

TO INCREASE AND DIFFUSE KNOWLEDGE  
OF THE POLAR REGIONS,  
TO INSPIRE PEOPLE TO CARE ABOUT  
THE ARCTIC AND ANTARCTIC.  
TO PROTECT THE POLAR UNKNOWN.



## DEAR APS MEMBERS:

Herewith we present another engaging issue of our journal, and hope you will enjoy the photography of Florian Ledoux, 2020 Nature TTL Photographer of the Year, who has generously offered us a sample of his talents. Also on offer is a timely history piece by Mia Bennett about the 1918 influenza epidemic's impact on the Arctic region. Plus, we have our usual catalog of published works, and even an introduction of *Symphony Antarctica*, a new music CD recording by Valmar Kurol and Michael Stibor.

First, some sad news: I am sorry to note that since our last issue was published, we lost Dick Cameron, our Membership Chair - a big blow not only to our Society, but to the larger polar community as a whole. We all send our thoughts and condolences to his family and friends. His position has been filled by George Blaisdell, a friend of the American Polar Society, who stepped up to the new challenge.

We also regret to report the passing of two other long-time friends and supporters of all things Antarctic. Paul Dalrymple, President of the Antarctic Society and old polar hand, passed away on April 24th. It was only a few months earlier that we lost Paul's dear friend and companion, Gracie Machemer, who was a loyal patron of the Antarctic Society and hostess to many gatherings of that organization in Port Clyde, Maine.

Furthermore, this mysterious coronavirus has thrown up publishing roadblocks at various unexpected turns. It also precipitated the cancellation of many collaborative polar conferences, including the 43rd Antarctic Treaty Consultative Meeting, which would have been held in Finland this year. Also called off are the SCAR Open Science Meet-

ing, the meeting of the Council of Managers of National Antarctic Programs (COMNAP) in Australia, as well as the annual meeting of the International Association of Antarctic Tour Operators (IAATO).

Notwithstanding, please enjoy this issue. Stay in touch, let us know how you are doing, and if you have an article you would like us to consider for publication, we invite you to contact us.

All the best,  
Ray

**Ray Arnaudo** is a retired diplomat and former Senior Scholar at the American Association for the Advancement of Science, with a career of experience in international environmental and science policy affairs at the State Department. He is currently a member of the National Science Foundation's Polar Affairs Advisory Committee.

# LETTER FROM THE EDITOR



## STRANGE TIMES, THESE:

I can't decide whether the novel we've all been unceremoniously thrust into was authored by Lewis Carroll, Stephen King or Alan Moore. In a world obsessed with murder hornets, toilet paper, and yes, that terrifying spiky virus, it's clear that even the definition of "normal" has changed. It is interesting to note that while the MOSAiC research expedition in the Arctic (see article) will face unexpected challenges due to the cancellation of a series of scientific flights, Antarctica is still considered to be the "safest place in the world."

With the objective of providing content that might temporarily eclipse today's incessant confounding news headlines, it has been a privilege to work with Florian Ledoux – our featured polar artist – whose breathtaking aerial photography reveals his deep passion for the Far North, which he hopes will motivate us to be more conscientious stewards of the Arctic.

Also in this issue, we present the film *Genesis 2.0*. In one of its scenes, a team of researchers excavates an ancient animal carcass in the farthest reaches of the Siberian Arctic. The men chip away at the ice with axes, working their way around the enormous body. Suddenly, from a chink in the ice, a dark fluid comes dripping out: mammoth blood. Such a find is the holy grail for hi-tech cloning scientists in Russia, China and the US who have been desperate to find well-preserved DNA. They want to bring the extinct woolly

mammoth back to life. It is an intriguing idea even if one chooses to ignore the ethics of cloning. I leave that for you to decide should you watch the speculative documentary.

Mia Bennett's *CRYOPOLITICS* piece speaks for itself, particularly in these times. It is indeed plausible that the current pandemic could turn out to be a dress rehearsal for what lurks in the permafrost, pointing not just to our own vulnerability, but also to the moral imperatives of arresting global warming.

As a proverbial dessert, if you will, I am delighted to present the work of Sarah Airriess, ex-Disney animator whose endeavor to bring an Antarctic story to life in the form of a graphic novel captured my fancy so much that I chose to share her remarkable artistic talents with the broader polar community. No doubt there will be more of these! Start your collection now!

I would be remiss if I didn't admit my palpable grief at the loss of three dear friends, Paul and Gracie, and especially Dick Cameron who was more family to me than merely great friend and colleague. In their departure, each took with them a chunk of my heart.

With that, I leave you now to your reading pleasure.... Hopefully, by the time you reach the last page, you will have been enlightened in some way, or at least provisionally distracted.

Polarly yours,  
–Moki Kokoris, Editor

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**Enhancement Reminder:** *The Polar Times* is now augmenting its content with QR technology, which offers readers with QR-code reader apps on their "smart" devices a way to view videos and listen to interviews or music relevant to the article. For anyone who does not yet have the app, go to i-nigma and download it. It's free! URL: <http://www.i-nigma.com/downloadinigmareader.html> Then launch the app on your mobile device, point the camera at any of the black-&-white QR-code squares, and voila! The video will play or additional supplemental article/s and websites will appear!



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The American Polar Society was founded on November 29, 1934, to band together all persons interested in polar exploration. Members are entitled to receive *The Polar Times* twice a year. The American Polar Society is classified as a tax exempt organization under Sec 501(C)3 of the IRS Code.

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## Dr. Richard “Dick” L. Cameron

July 11, 1930 - July 22, 2019

**DICK’S FAVORITE STATEMENT**, which was true and dear to his heart, is often quoted:

*“Antarctica is a special place. It is a place where men and women of all nations and ethnic backgrounds can live and work in harmony...”*

**DICK CAMERON** earned a Bachelor of Science degree in Geology at the University of New Hampshire. He completed his graduate studies in Glaciology and Quaternary Studies at the University of Stockholm, and obtained his PhD in Geology from Ohio State University. In 1957, he first wintered in Antarctica at Wilkes Station.

His professional positions included appointments as Chief of Geotechnics Branch, Terrestrial Sciences Laboratory, Air Force Cambridge Research Laboratories; Assistant to the Director, Institute of Polar Studies, Ohio State University, as well as Assistant Dean of University College and Assistant Dean for International Programs; Program Manager for International Organizations, International Programs and then

Program Manager for Glaciology for the Division of Polar Programs of the National Science Foundation.

The following excerpt is from a Le Cercle Polaire interview with Dick Cameron in December 2014. In his own words:

*“My cousin gave me a copy of ‘The Royal Road to Romance’ by Richard Halliburton, which peaked my interest in seeing the world. In 1953, between my junior and senior years at college, I attended the University of Oslo Summer School and then worked with the Norwegian Polar Institute on glaciers in Norway. After that I knew what I would be doing for my life’s work: Greenland 1954; Sweden 1955; Antarctica 1956-1958; and so on studying glaciers. I eventually became the Glaciology Program Manager in the Division of Polar Programs.*

*“When I was at the National Science Foundation, I was on a committee studying the possibility of towing icebergs as a source of water for Saudi Arabia. Prince Mohamed al Faisal al Saud was funding the project. I received a call that a meeting was to be held the following week in Paris. I said I was particularly busy and probably could not make it. They said, ‘Take the Concorde.’ I said, ‘I’m coming.’ It took three and a half hours to get there from Washington, DC. Halfway across the Atlantic on the return flight*

*I was invited up to the flight deck and sat for some time with the pilots. Quite a thrill, and at 60,000 ft, you can see the curvature of the Earth!*

*“During the austral season 1964-1965, I participated in the Queen Maud Land Traverse from the geographical South Pole to the Pole of Relative Inaccessibility in the middle of East Antarctica. Charlie Bentley lead the first half of the traverse and yours truly the second half. Going from 2,820 m (9,250 ft) elevation at the South Pole to 3,657 m (12,000 ft) at Inaccessibility, we traveled 1,200 km (750 miles) at the breakneck speed of 8 km/h (5 miles per hour). Undertaking a series of studies en-route, the traverse took two months. It was exciting to be crossing a part of the Earth where no man had been before.*

*“A great moment for me was standing at the geographical South Pole with my son Andy in November of 1979. He was just finishing his winter-over year at the Pole and I had just arrived to be the NSF Representative at the Pole for the summer.*

*“Antarctica is a special place – as I consider it the epitome of the way the rest of the world could one day be. The IGY was the prime example of cooperation ‘ON ICE’ when their respective countries were at odds with one another.”*



Counter clockwise from left: Dick Cameron • Richard Goldthwait and Dick Cameron look over a map of Antarctica, 1960 • Dick and Andy at the Geographic South Pole, 1979 • Dick Cameron. South Pole – Queen Maud Land Traverse, front row: Norman Peddie, U.S. Coast and Geodetic Survey, geomagnetism/navigation; Edward “Ahab” Parrish, University of Wisconsin, traverse engineer; **Richard L. Cameron**, Ohio State University, glaciology/co-leader; Olav Dybvadskog, Norwegian Polar Institute, glaciology; Edgard E. Picciotto, Free University of Brussels, glaciology. Back row: James Gliozzi, Ohio State University, glaciology; Bruce Redpath, University of Wisconsin, geophysics; John Beitzel, University of Wisconsin, geophysics. Raymond Koski, University of Wisconsin, traverse engineer; Charles Bentley, University of Wisconsin, geophysics/co-leader.



## Dr. Paul Clement Dalrymple

November 21, 1923 – April 24, 2020

**A ROCKLAND, MAINE NATIVE**, Paul studied at Worcester Academy and later briefly at Clark University, but interrupted his studies to enlist in the U.S. Army.

Serving during World War II, Paul was taken prisoner at the Battle of The Bulge. He spent nearly a year in a German POW Camp before being liberated by Allied forces. Honorably discharged in January 1946, Paul was honored with the Silver Star for his service.

Returning to the States, Paul resumed his studies at Clark University, went on to receive a Masters Degree from Syracuse University in 1952, and finally his PhD in Geography from Boston University in 1964. He served as a Geographer and Meteorologist with the U.S. Army Quartermaster Corps and Corps of Engineers for many years.

During his long career, Paul was involved in research projects in many countries. In 1957, Paul jumped at the opportunity to work in Antarctica for the International Geophysical Year in Little America, fulfilling a lifelong dream.

He returned again in 1958 to continue his research. For his efforts, he was honored by having a mountain named after him, Mt. Dalrymple, in the Sentinel Range in West Antarctica.

Paul's seven decades of weather observations took him from Marshall Point to the Blue Hill Observatory outside Boston, then to the inhospitable top of Mt. Washington, to 3 years on a boat in the stormy North Atlantic from the Azores to Greenland, and 2 years in Antarctica studying temperature and wind speed profiles while enduring deep snow and temperatures of 50 below zero at Little America and nearly 100 below at the South Pole.

Back at home on Marshall's Point in Port Clyde, Maine, where the climate is unequivocally gentler and kinder, yet even in the worst winters, Paul spent 20 years (1995 to 2015) collecting and reporting weather data to the National Weather Service and TV Channel 13. Even in retirement, Paul still kept a close weather eye on temperatures, rainfall and snow accumulations.

He maintained his lifelong interest in Antarctica by serving as a guest lecturer on more than 25 Antarctic cruises in the 1990's, and for over 35 years, he served as editor for the Antarctica Society, publishing their regular newsletters as well as hosting summer get-togethers at his Port Clyde home.

## Grace Machemer

June 30, 1926 – Oct. 8, 2019

**A BROOKLYN, NY NATIVE** and graduate of Smith College in Northampton, MA, Gracie settled in Laconia, NH, where she taught high

school biology. After receiving a Master of Science degree in biology from Plymouth State College and teaching science at Mary Hitchcock Memorial Hospital School of Nursing, she moved to Belgrade where she was a teacher of biology at Thomas College in Waterville for 14 years. Eventually retiring in Port Clyde, MA, she immersed herself in volunteering for the Penbay Women's Auxiliary, the Jackson Memorial Library, and the Marshall Point Lighthouse. Grace was an accomplished rug maker, had a strong interest in the history of map-making, was an avid birder and reader, and enjoyed traveling the world – even to Antarctica. Twice!

We in the wider polar community, knew her as a long-time member of the Antarctic Society and steadfast companion to Paul Dalrymple. Gracie was the very gracious co-host of many of the gatherings at Port Clyde, Maine. She loved seeing and interacting with members who attended, and always greeted everyone with a warm smile and a kind word. She will be terribly missed.

Both Paul and Gracie deserve our deepest admiration for being catalysts of camaraderie, and for their generosity to all members and friends of the Antarctic Society and the American Polar Society.



Paul Dalrymple was a driving force behind the Antarctic Society for many years. An Antarctic during the International Geophysical Year (IGY), he served two consecutive years on the ice from 1957-59 at Little America V and Amundsen-Scott South Pole Station. This interview, recorded in 2007, is the story of his life told in his own words. The QR links to the interview video.



## THE LARGEST POLAR EXPEDITION IN HISTORY – AND ITS MASTERSTROKE LOGISTICS

127 YEARS AGO, the Norwegian researcher and explorer Fridtjof Nansen set sail on the first ever drift expedition with his wooden sailing ship *Fram*.

In September 2019, following in Nansen's footsteps, the German research icebreaker *Polarstern* set sail from Tromsø, Norway, to spend one full year drifting through the Arctic Ocean – trapped in ice. The goal of the MOSAiC project is to take the most comprehensive look ever at the Arctic as the epicenter of global warming.

The name **MOSAIC** (Multidisciplinary drifting Observatory for the Study of Arctic Climate) mirrors the complexity and diversity of this expedition.

Hundreds of researchers from 20 countries are taking part in this exceptional endeavor. The data gathered will be used by scientists around the globe to take climate research to a completely new level. Designed by an international consortium of leading polar research institutions, and a total budget exceeding 140 Million€, MOSAiC was spearheaded by Alfred Wegener Institute, Helmholtz Center for Polar and Marine Research (AWI). The project is led by atmospheric scientist Markus Rex, and co-led by Klaus Dethloff and Matthew Shupe.

### Understanding the consequences of Arctic climate change

- MOSAiC will contribute to a quantum leap in our understanding of the coupled Arctic climate system and its representation in global climate models.
- The focus of MOSAiC lies on direct in-situ observations of the climate processes that couple the atmosphere, ocean, sea ice, biogeochemistry, and ecosystem.



A lead running beneath *Polarstern* and through the MOSAiC floe, captured from a drone. Credit: Manuel Ernst/UFA.

### An entire year trapped in the ice

The backbone of MOSAiC is the year-round operation of RV *Polarstern*, drifting with the sea ice across the central Arctic during the years 2019 to 2020. During the set-up phase, RV *Polarstern* entered the Siberian sector of the Arctic in the thin sea ice conditions of late summer.

A distributed regional network of observational sites has been set up on the sea ice in an area of up to ~40 km distance from RV *Polarstern*. The ship and the surrounding network drifted with the natural ice drift across the polar cap towards the Atlantic as the sea ice thickened during winter.

Large scale research facilities addressing key aspects of the coupled Arctic cli-

mate system have been set up on board of RV *Polarstern* and on the sea ice next to it, in the so-called ice camp.

The distributed regional network further around the central observatory is comprised of autonomous and remotely-operated sensors, characterizing the heterogeneity of key processes in an area representing a typical grid box of modern climate models and providing invaluable data for the development of parametrizations for sub-grid-scale processes in climate models.

### The mission of MOSAiC

The Arctic is the key area of global climate change, with warming rates exceeding twice the global average and warming during winter even larger. It is well pos-

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*In September 2019, following in the footsteps of Fridtjof Nansen, the German research icebreaker Polarstern set sail from Tromsø, Norway, to spend one full year drifting through the Arctic Ocean – trapped in ice.*

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sible that the Arctic Ocean will become ice free in summer during the 21st century. This dramatic change strongly affects weather and climate in the whole northern hemisphere and fuels rapid economic development in the Arctic.

Many processes in the Arctic climate system are poorly represented in climate models because they are not sufficiently understood due to the lack of observations in the central Arctic, especially in winter and spring. During these seasons sea ice is so thick that even the best research icebreakers cannot penetrate into the Arctic and researchers have always been locked out making future climate change projections for the Arctic uncertain, likely more than anywhere else on the planet.

The ultimate mission of MOSAiC is to broaden our understanding of the Arctic climate system by providing a more robust scientific database that would be used in policy decisions on climate change mitigation and adaptation, and for establishing a more cogent framework for sustainable Arctic development.

## RV *Polarstern* and MOSAiC

Originally commissioned in 1982, the *Polarstern* is, to this day, still one of the most advanced and versatile polar research ships worldwide. Between 1999 and 2001, the ship was completely overhauled and now carries the latest equipment and technologies available. This is why she usually operates 317 days on average every year. Covering about 50,000 nautical miles per year, *Polarstern* carries out scientific research as well as resupplies the research stations run by the Alfred Wegener Institute – such as the Neumayer Station III, an Antarctic base manned year-round. Until 2019, *Polarstern* has logged more than 1.7 million nautical miles, which equates to roughly 3.2 million kilometres.

Even for the reliable *Polarstern* and her highly experienced crew, the MOSAiC expedition poses quite a challenge. Only thanks to her special technical details can this ship be the centre of an expedition with

the dimensions of MOSAiC. Not only is *Polarstern* capable of operating in the pack-ice zone, but owing to her double-walled steel hull and 20,000 horsepower, she can also easily break through 1.5-metre-thick ice and overcome thicker ice by ramming. Being equipped for sustained operations at temperatures like in the Arctic winter, down to -50 degrees Celsius, *Polarstern* is also capable of staying the winter in the ice of the polar seas.

However, it isn't nearly as cold inside the ship, where the approximately 100 MOSAiC researchers, technicians and crew members work and live. In the various scientific labs, the international experts conduct research across the five main areas of interest (atmosphere, ocean, sea ice, ecosystem, biochemistry). For MOSAiC, this set-up will be complemented with specific scientific equipment, instruments and lab containers, and even a special additional crane has been installed.

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*The ultimate mission of MOSAiC is to broaden our understanding of the Arctic climate system by providing a more robust scientific database that would be used in policy decisions on climate change mitigation and adaptation, and for establishing a more cogent framework for sustainable Arctic development.*

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Additionally, the *Polarstern* has various vehicles (helicopters, snowmobiles, Pistenbullies, etc.) on board, allowing the researchers to take measurements and gather data not only in the central observatory but also in the distant distributed network. The cutting-edge onboard computer system ensures that all scientific data are regularly recorded, saved and forwarded.

## The complex logistics that make MOSAiC possible

Resupplying the greatest expedition of all time in the central Arctic has to fulfill two vital criteria: it must be painstakingly choreographed and at the same time be extremely flexible. After all, during each phase of the expedition, roughly one hun-

dred people will be researching, working and living on board the icebreaker *Polarstern* and on the surface ice of the Arctic Ocean, and the researchers and crew, together with their gear, will be rotated every two to three months.

In this regard, the logistical planning for MOSAiC has to overcome the challenge of safely and reliably transporting staff and equipment to one of the most remote – and hostile – regions on Earth. Doing so with supply icebreakers is not possible during the near half year-long period from February to June when the ice is too thick to be broken.

And the Arctic ice conditions in the winter and spring can bring even the most powerful icebreakers to their knees. Accordingly, to give MOSAiC the best-possible chance of success, its logistics experts have pursued an approach that is as varied as it is flexible. An indispensable element, despite all of these preparations: having more than one 'plan B' ready, so that the expedition's

logistical plan can quickly adapt to every contingency.

Thankfully, RV *Polarstern* didn't have to get started on her own: when she departed Tromsø on 20 September 2019, bound north, the flagship of the Alfred Wegener Institute was accompanied by the Russian research vessel Akademik Fedorov. The two ships supported each other when breaking into the ice and further researchers, who helped set up the research infrastructure on site, as well as an international group



For a virtual 3D tour of the RV *Polarstern*, scan this QR code.



ABOVE: *Polarstern* at MOSAiC ice floe. October 9, 2019, © Esther Horvath. TOP RIGHT: *Polarstern* has arrived at MOSAiC ice floe, October 5, 2019, © Sebastian Grote. LOWER RIGHT: Marc Oggier and Allison Fong measure ice core at the dark side of the ice floe. December 8, 2019. © Esther Horvath.

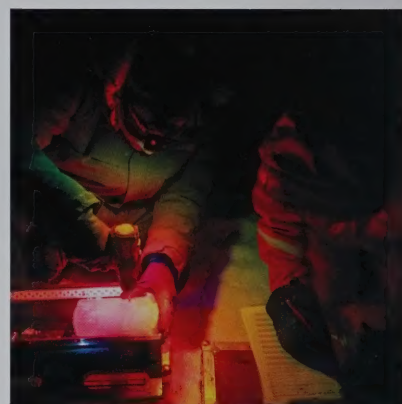
of 20 young investigators, were on board. And when it came to looking for the 'perfect' ice floe, which has the right qualities for the Ice Camp, the two ships were supported by their own helicopters. Later, once *Polarstern* had anchored at the ice floe, allowed herself to become frozen in the ice, and dispatched her scientific crew to set up the central research stations on the ice, Akademik Fedorov began deploying automatic monitoring stations in a radius of up to 40 kilometres. And throughout the expedition, the researchers will use *Polarstern*'s two on-board helicopters to visit remote stations from time to time, in order to conduct routine maintenance or retrieve the latest data. The nearby stations and measuring equipment are a different story: the researchers can reach them using one of eight snowmobiles or, to keep emissions to a minimum, on foot.

The fuel for these vehicles, for the helicopters and planned research flights, and above all to keep the icebreaker and the stations on the ice up and running, could be found on board *Polarstern* and Akademik Fedorov – not to mention all of the expedition equipment, including provisions. Additional fuel will be supplied by the massive Russian icebreaker Kapitan Dranitsyn, which will also make the first and second resupply runs in December 2019 and February 2020, when the ice is still thin enough to break

through it; they will involve exchanging the *Polarstern* crew, the researchers and their gear, and delivering fuel and provisions. On her return journey, Kapitan Dranitsyn will take with her not only crew members, researchers and their gear, but also any waste that isn't suitable for *Polarstern*'s special litter-incineration system.

Since the Arctic winter will only just be beginning, in December and tentatively even in February the odds are comparatively good that the Russian icebreaker will be able to reach *Polarstern*. But with every week after February, more water in the Arctic Ocean will freeze, the ice will become thicker, and the chances of breaking through it will plummet. Consequently, when the planned third crew and staff exchange rolls around, in mid-April 2020, instead of icebreakers, large transport aircraft will bring personnel and cargo to the floe.

These aircraft need not only suitable weather for flying, but also two other things: enough fuel for them to make it back home, which the icebreakers will bring with them on earlier resupply missions; and a landing strip, which will be prepared by the MOSAiC team. In this regard, the team can draw on the lessons learned by Russian researchers: after all, on a much smaller scale than MOSAiC, since 1937 Soviet and later Russian researchers have set up more than 30 small ice-drift stations in the Arctic Ocean,



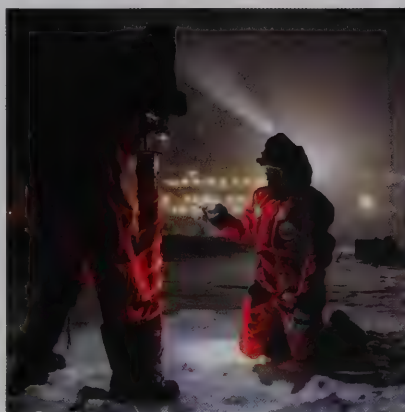
which also had to be resupplied by air. As such, Russia has substantial knowhow on making landing strips on ice floes.

For safety purposes, the landing strip will be built some distance from *Polarstern* and the ice camp. This will be done using a heavy-duty milling machine that is normally used to prepare new streets and motorways. After being refitted for use in ice, it was mounted on the back of a snowcat. Needless to say, the prototype also had to be tested: it was put through its paces on Gepatsch Glacier at the upper end of the Kaunertal valley in Tyrol, so as to avoid any unpleasant surprises when it will be deployed on the ice of the Arctic Ocean.

To accommodate the Russian Antonov planes that will most likely be used for the crew exchange, the landing strip on the ice should optimally be 1,800 metres long and 42 metres wide, which means the snowcat-mounted milling machine will have plenty of work to do. In some cases, the efforts

of the large machines are complemented by manual work with chainsaws and even pickaxes. Afterwards, the snow cat uses a large plough to smooth the landing strip, which will of course also be used by the research aircraft involved in MOSAiC. But the ice landing strip isn't exactly built to last a lifetime: wind, ocean currents, and tides take their toll on the ice floe, and from time to time a repair team has to be sent to the landing strip. If e.g. a crack has formed, it can be filled with water, which quickly freezes in the Arctic cold and essentially repairs the damage. Nevertheless, the landing strip for the MOSAiC aircraft will only be used in this specific phase of the expedition – after which the ice conditions will make it impossible to safely take off and land.

All that's missing now are the signs and lights that let the pilots know, during the daytime and of course during the Polar Night, where to land and take off from. To guarantee that the signs are clearly recognisable from a distance, and from the air, some have to be several metres long and wide. The problem: such huge signs would take up a great deal of valuable cargo space on the icebreaker. But the MOSAiC logistics experts found an ingenious solution: they hired a sail maker to fashion the large signs for the MOSAiC landing strip from the tarp used on commercial curtain-side trucks, allowing them to be folded for compact transport. In addition, just like any normal airport, the aircraft warning lights required for international air traffic will also need to be installed on the ice floe. The reason: if the resupply ship *Kapitan Dranitsyn* is unable to reach *Polarstern* in February



Scientific teams conduct scientific hand over.  
© Alfred-Wegener-Institut / Esther Horvath (CC-BY 4.0)

2020, aeroplanes will have to take its place, and during the Polar Night they can't possibly take off or land without lights.

In the event that the landing strip plan proves unfeasible, long-range helicopters represent an alternative means of transporting researchers, crew, equipment and supplies to the station. Yet this plan B has a number of disadvantages – which makes it clear why the MOSAiC planners were willing to invest so much effort in making a landing strip to begin with: compared to aeroplanes, long-range helicopters consume significantly more fuel to transport the same amount of weight, which greatly limits their range.

Nevertheless, it must be ensured that this plan B can be put into action if necessary: consequently, to guarantee that the ice station could be resupplied, and that researchers and crew could be rotated in and out, prior to the start of the expedition fuel depots were installed on islands located as far north of the Siberian coast as possible.

Since it's impossible to predict *Polarstern*'s drift route with absolute certainty, several of these depots, where helicopters can touch down and refuel, were set up.

In the unlikely event that this resupply option also fails because *Polarstern* is out of range from the fuel depots or the weather does not allow these complex airlift operations, when she leaves port *Polarstern* will have sufficient fuel, provisions and equipment on board to keep her running through June 2020 without any external support. And potable water isn't a problem, since the ship's own systems can harness it from seawater. Moreover, by June the Polar Night will be long over, which means the ice will become thinner – and support icebreakers will then be able to reach *Polarstern* in her drifting prison.

The first visit of a vessel after the long phase of isolation is scheduled for mid-June 2020, when the Swedish research icebreaker *Oden* will traverse the thinning ice to bring *Polarstern* new researchers and supplies. And not just once: since *Oden* is much smaller than e.g. *Kapitan Dranitsyn*, the icebreaker will pay *Polarstern* another visit in mid-July.

In mid-August the brand-new Chinese icebreaker *Xue Long 2* will follow suit, with a new crew, new group of researchers, equipment and much more on board. And when they depart again, *Xue Long 2* and *Oden* will not only take researchers, crew and litter with them, but also any equipment that is no longer needed.

To learn more and to follow the MOSAiC Expedition, visit their news page at: <https://mosaic-expedition.org/news/>.

## LATEST BULLETIN - ISSUED ON MARCH 16, 2020

*MOSAiC aerial survey campaigns for the atmosphere and sea ice temporarily suspended*

ON THURSDAY MARCH 12, 2020, the Norwegian government announced comprehensive measures to combat the

spread of the coronavirus, effective immediately. As a result, all travellers to Norway from non-Nordic countries who do not have a residence permit will most likely have to immediately leave the country again or be placed in quarantine for 14 days. In response, and due to the highly dynamic

development of the coronavirus pandemic, on Friday, March 13, the MOSAiC project management decided to temporarily suspend the aerial survey campaigns planned for this spring and based in the Svalbard archipelago, which is under Norwegian administration.

# WHAT THE ARCTIC REVEALS ABOUT CORONAVIRUS



by Mia Bennett

Link to Mia's CRYOPOLITICS blog:

<http://www.cryopolitics.com/2020/03/21/arctic-coronavirus/>

A LITTLE OVER A CENTURY AGO, the "Spanish" flu spread around the world with an astounding speed as millions returned home from the battlegrounds of World War I. (While the virus likely did not actually originate in Spain, the neutral country's media was the only one within Europe to cover its outbreak sufficiently, as other countries censored reports). Many young men who had survived gruelling trench warfare succumbed to pulmonary hemorrhage, edema, and other respiratory infections caused by a deadly strain of the H1N1 influenza virus. Between 1918 and 1920, it infected 25% of the world's population, killing between 17 million and 50 million people. Unusually – and unlike with the COVID-19 virus currently ravaging the planet – young people were hit hard particularly hard.

Exactly one month later in Alaska's

The biological residues of the 1918 Spanish Flu dug up from the Arctic's frozen recesses may help inform how we react to the coronavirus pandemic unfurling today. Shown above: Kaktovik cemetery

Seward Peninsula, Spanish influenza was reported as "cutting out a fearful swath of death...and now, believed at the turning point in this section, is spreading still farther northward towards the Arctic, and down the coast."

the Alaska Daily Empire reported in November 1918 that out of 250 Iñupiat in the vicinity, only 75 were left, with "others dying daily." Underscoring the disturbingly unequal mortality rate of the disease between Natives and Whites, the

*Permafrost decay can release long hidden diseases and viruses into the environment, threatening the health of both people and animals.*

As travelers wound their way home, the virus penetrated distant corners of the Earth like the Pacific Islands and the Arctic. In October 1918, seven men aged between 18 and 29 sailed 1000 kilometers north from Norway for new jobs in Svalbard's coal mines. During that fateful voyage, they contracted the Spanish flu. Knocked dead by the virus, the men were interred beneath the permafrost in glaciated Svalbard.

The virus hit Native communities hard. Outside the gold mining town of Nome,

same article reported, "Nineteen white persons in Nome have succumbed, but conditions among the whites are improving." While government authorities made efforts to help the Natives, setting up orphanages and sending dog teams and medical care, for instance, their vulnerability to the virus was exacerbated by the conditions of forced settlements, which were often overcrowded and unhygienic, and the deeper traumas of colonialism. Across the state, children were left orphaned, their parents taken by a flu

ON AN ISLAND MORE FAMOUS FOR STORING FROZEN SEEDS THAN FROZEN VIRUSES, SCIENTISTS SUCCESSFULLY EXHUMED SIX OF THE SEVEN BODIES OF THE WOULD-BE YOUNG MINERS AFTER OBTAINING PERMISSION FROM THEIR FAMILIES... TAUBENBEGER'S TEAM FINALLY COMPLETELY SEQUENCED THE 1918 INFLUENZA VIRUS, DETERMINING THAT IT HAD COME FROM BIRDS.

that originated continents away. Given the stark differences in health and quality of life outcomes between Native and White communities that persist to this day, it is likely that coronavirus will have highly unequal impacts on the two demographics as well.

### Unearthing the 1918 influenza from permafrost

In the village of Brevig Mission (then called Teller Mission) north of Nome, the Spanish flu killed 75 out of 80 residents in the span of just five days in November 1918. The community had already experienced a difficult year, losing its mission building to a fire that August (a loss which sadly parallels the fire that consumed the school in the village of Kaktovik just last month).

After the horrifyingly swift spate of flu deaths, the Alaska territorial government sent gold miners up from Nome to use steam points to dig a mass grave in the permafrost two meters beneath the surface. One of the flu's victims lain to rest there was a heavyset Iñupiaq woman. Little did the dead know that one day, one of their frozen lungs would be cut out in a quest to understand exactly why the pandemic was so deadly.

In 1951, Johan Hultin, a young Swedish-American pathologist, traveled to Brevig Mission after learning of the mass grave. Since it had been encased in permafrost for decades, he believed that frozen, infected lung tissue might store intact virus material. Hultin received permission from Elders to exhume some of the bodies, from which

lung tissue was obtained. Efforts to revive the virus failed, however, and Hultin gave up on his mission, at least for a while.

In a tale of scientific commitment and perseverance, nearly four decades later at the age of 72, Hultin came across the work of an American virologist named Jeffrey Taubenberger, who was also studying the 1918 influenza. Inspired by his work, Hultin, using \$3,200 from his savings account, led a team of pathologists on a return journey to Brevig Mission. A special meeting of the city council agreed to let the grave be reopened. Hultin and his colleagues identified that one of the bodies – that of the obese woman – had enough fat stores to have kept the internal organs from decomposing during brief periods of permafrost thaw, therefore preserving the virus. The scientists biopsied the lung tissue at the site of the grave. With the procured material, they were successfully able to sequence one of the genes in the virus for the first time.

Hultin's herculean effort was complemented by a team of scientists working on the other side of the Arctic in Svalbard. On an island more famous for storing frozen seeds than frozen viruses, scientists successfully exhumed six of the seven bodies of the would-be young miners after obtaining permission from their families. Their resting places were located one meter beneath the surface with the help of ground penetrating radar, which can peer beneath the Earth's surface, whether soil or ice. In 2005, using a variety of lung tissue

## INFLUENZA HAS WROUGHT HAVOC IN NOME REGION

**Native Population Almost Completely Wiped Out by Dread Disease; Many Whites Also Die.**

ALL accounts from Nome are that the influenza has caused a terrible scourge to the Seward Peninsula country. Most of the natives have died, and many white people have succumbed to the disease.

Since the dispatch from Nome, taken from the Seattle Post-Intelligencer and printed below was received, telegrams have been received that place the number of native deaths at 180 and that of the whites at 21. In addition to the names printed in the dispatch, it is said that George Prosser, Charles Thomas and Charles W. Reed have passed away.

The dispatch referred to follows:  
NOME, Alaska, Nov. 15.—Spanish influenza has cut out a fearful swath of death in Seward peninsula, and now, believed at the turning point in this section, is spreading still farther northward towards the Arctic, and down the coast.

samples including one from the deceased Iñupiaq woman in Brevig Mission, Taubenberger's team finally completely sequenced the 1918 influenza virus, determining that it had come from birds.

While the work of these researchers continues to be heralded, especially as the world confronts a new flu epidemic, it is also important to acknowledge the local and Indigenous who make their studies possible. In a 1998 interview, Hultin expressed, "The only sample we (found was) there because the elders of Brevig Mission let me go back into the grave again...They gave us the opportunity to do something good — not just for themselves but for the whole world."

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*Coronavirus is a global pandemic. The number of infected cases in the Arctic shows that it has already quickly reached the planet's more remote fringes just as the 1918 influenza did a century prior.*

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## As Earth warms, viruses will be lost and gained

Scientists were able to uncover the origins of the mysterious 1918 influenza virus thanks to the icy band of permafrost that stretches across the top of the planet. Underlying much of the Arctic, the thick layer of soil that has been frozen for at least two years has kept everything from enormous mammals like woolly mammoths to microscopic particles like viruses locked into the ground. Across the North, however, this permafrost is rapidly thawing, as a recent dataset published by the European Space Agency's Climate Initiative illustrates.

While the ground beneath the Arctic cracks and melts, viruses long locked into the soil escape. One concern in Russia is anthrax, a highly toxic bacteria endemic to the country and which thrives among its domesticated and wild ungulate populations, namely reindeer, when unvaccinated. In the 1920s, anthrax was so prevalent and so devastating to reindeer on the Yamal Peninsula that it became known nationwide as the "Yamal disease." Those outbreaks had a fatal echo a century later in August 2016, when a young boy died and twenty people were hospitalized after being exposed to anthrax. It's believed that, during the hot dry summer of 2016, these infections were caused by the exposure of a reindeer carcass infected 75 years ago.

Permafrost decay can release long hidden diseases and viruses into the environment, threatening the health of both people and animals. The loss of this frozen ground may also cause the loss of information regarding past epidemics that could help us fight present ones or even prevent future ones. Forget trying to resuscitate mammoths: had scientists not had access to the well-preserved bodies at Brevig Mission, society might have an even weaker

understanding of the 1918 influenza, whose exact origins and particular deadliness for young people still baffle scientists.

A better grasp of historic flu pandemics can help researchers come to grips with ongoing ones like COVID-19, and those in the future that humanity will undoubtedly face again. Climate change mitigation – particularly keeping permafrost frozen – therefore doesn't just promise benefits for the environment. Preserving the ice can directly aid epidemiology and public health, too.

## Arctic communities remain vulnerable to viruses

A few weeks ago, as I was sitting at my desk in Hong Kong after returning from fieldwork on Alaska's North Slope, an urgent email popped up in my inbox. A contact in Utqiagvik, Alaska had gotten in touch to say that at the North Slope Borough Assembly Meeting in late February, someone from the village of Kaktovik had raised the concern that after speaking with me – someone who appeared Chinese – in late January, he felt unwell and developed a cough. I hadn't been sick at the time and hadn't traveled to Mainland China, so I at first felt his concern was unwarranted.

Yet upon reflection, given the devastating effects that respiratory diseases have had on Arctic and particularly Native and Indigenous communities in the past, anxieties about coronavirus are understandable. Beginning in the late 1700s, settlers, miners, fur trappers, and other new arrivals to Alaska imported tuberculosis. By the 1930s, Alaska had some of the highest rates of infection the world has ever seen. The deadly bacteria was responsible for some 35% of Native deaths each year, making it the single highest cause of mortality. To this day, Alaska has some of the greatest number of cases of tuberculosis in the United States.

Coronavirus is a global pandemic. The number of infected cases in the Arctic shows that it has already quickly reached the planet's more remote fringes just as the 1918 influenza did a century prior. Just yesterday, Iceland saw its first person to succumb to coronavirus. It was not an Icelander who died, but, morbidly indicative of the country's tourism industry, a 36-year-old Australian man.

In light of the dire state of healthcare in many Alaskan villages and in the wider Arctic, it is critical that strict measures are taken to prevent the further spread of coronavirus. Greenland's decision to suspend all air travel for two weeks both to the country and within it may seem drastic. But in a place without roads and where flying is commonplace (features common across much of the Arctic), restrictions on aviation may be temporarily necessary to curb the virus' spread.

With the lack of hospitals and clinics in the north, not to mention ventilators, it is already hard enough to control infections and diseases that humans have long known about such as anthrax and tuberculosis. Let us hope that the biological residues of a deadly virus a century ago dug up from the Arctic's frozen recesses may help inform how we react to the pandemic unfurling today. And while coronavirus seems to be an imminent and pressing danger that makes the threat of climate change seem slow and even inconsequential in comparison, we should not forget that the long game of halting its tide and keeping permafrost frozen may also hold the keys to averting future viral catastrophes.

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**Mia Bennett** is an assistant professor in the Department of Geography and School of Modern Languages & Cultures (China Studies Programme) at the University of Hong Kong, and editor of the Cryopolitics blog. Through fieldwork and remote sensing, she researches the politics of infrastructure development in frontier spaces, namely the Arctic and areas included within China's Belt and Road Initiative.

# RESEARCH VESSEL HARASSES 700 NURSING BELUGA WHALES

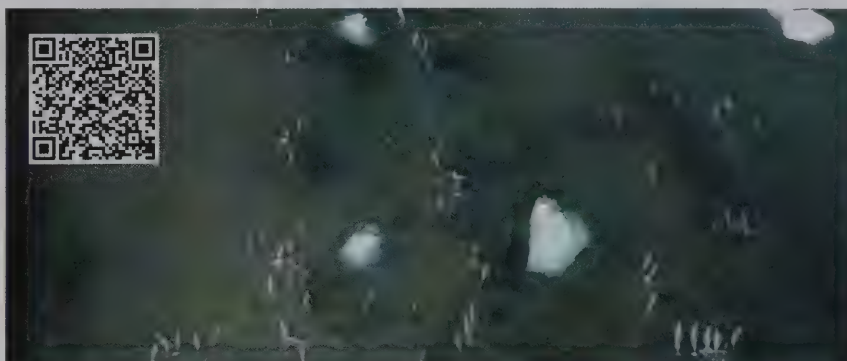
Arctic Watch

July 30, 2019

Along the shores of Cunningham Inlet (in Nunavut), July 28th started like any other day. Guests began to emerge from their tents, and the midnight sun climbed over Arctic Watch Wilderness Lodge. Large pans of ice dominated the skyline of the Northwest Passage and not a breath of wind disturbed the calm water. For 20 years, the Weber family has operated Arctic Watch, a wilderness lodge situated along the banks of one of the largest known beluga nurseries in the world. The whales enter the sheltered inlet for a few short weeks each year to nurse their young and frolic in the warm river water that spills into the inlet.

This coexistence was altered when a large icebreaker anchored outside Cunningham Inlet, and launched two zodiacs. Until that day, the Webers had never seen a motorized vessel of any kind venture into the inlet. The zodiacs, which belong to the Swedish icebreaker *Oden*, motored into the bay while hundreds of young beluga whales nursed in the river mouth. Within 30 minutes, the bay emptied completely as the belugas fled from the intruding noise of the two zodiacs.

The researchers aboard the *Oden* are members of the Northwest Passage Project, a high-profile research expedition, funded by the National Science Foundation and institutions such as the Canadian Wildlife Service, the Smithsonian, and the University of Rhode Island. Using the icebreaker and a helicopter to access remote regions of the Arctic Archipelago, the Northwest Passage Project is said to be a ground-breaking Arctic expedition intending to collect air, water and ice samples. The research cruise was in the middle of their 18-day voyage through the Northwest Passage when the vessel anchored outside Cunningham Inlet.



Link to full blog post and to drone footage that shows several hundred whales “stampeding out of Cunningham Inlet.” Note: the ship is in the foreground.

*We strongly believe that Cunningham Inlet should be restricted to non-motorized traffic. Any careless actions from vessels such as these will directly impact the Cunningham Inlet beluga whale population – one of the last beluga nurseries on the planet.*

Standing along the shore of Cunningham Inlet, Nansen Weber, who grew up in the Arctic, watched as the belugas he had spent his entire career studying vacate the bay almost instantaneously.

Brian Skerry, a renowned photographer and National Geographic Fellow, also happened to watch the event unfold. As part of a multi-year project for National Geographic, Brian had been photographing the beluga whales with Weber for three weeks. “That morning happened to have the most whales I had seen in the time I have been here. The whales were especially active that morning, and the day was shaping up to be perhaps the best we had seen.”

Known as the canary of the sea, belugas have an extensive vocal range. From shore, Weber and Skerry could hear a cacophony of chirps, gurgles and blows as the whales frolicked in the shallow waters. After the icebreaker was spotted outside the bay, it didn’t take long for this overwhelming sense of ease to change into panic. Skerry recalls, “Two zodiacs appeared in the inlet and within minutes we saw this mass exodus. After observing the drone foot-



age of them stampeding out, it became clear to me that they were stressed.”

The event was unlike anything the Weber family had ever seen before. “It is clear that this was an intentional and frantic exit. Within thirty minutes not a single whale could be found in the bay,” said Weber.

Skerry’s photography specializes in marine wildlife and he has dedicated his work to the protection of ocean ecosystems. He concluded by saying, “From my experience, this event speaks to how precious and fragile this ecosystem is to these animals and how sensitive these animals are to sound. It became crystal clear that this place cries out for protection and conservation.”

Arctic Watch staff made several attempts to make contact with the two zodiacs. From the water, the white tents of Arctic Watch Lodge are visible against the stark landscape of Cunningham Inlet. The *Oden* made no attempts to reach out to the lodge and appeared to evade contact.

We strongly believe that Cunningham Inlet should be restricted to non-motorized traffic. Any careless actions from vessels such as these will directly impact the Cunningham Inlet beluga whale population – one of the last beluga nurseries on the planet.

## MELT DOWN IN ANTARCTICA



by Keith Nicholls and David Holland

AT 600 METERS, this was by no means the deepest hole we'd ever drilled through an ice shelf, but it was certainly the widest. It had to be wide, to accommodate the girth of *Icefin*, a robotic submarine that was going to be deployed to explore the ocean cavity beneath the Thwaites ice shelf. Our drilling engineer was confident – drill slowly, and we'll make a big enough borehole. In the end, it was 35 cm or so wide, which was fine, even for *Icefin*.

This was early January 2020. There were a dozen of us at the field site, which was located near the grounding line of Thwaites Ice Shelf, floating in the Amundsen Sea, Antarctica. The team came from the British Antarctic Survey in the UK, New York University and other institutions across the US. It had been a significant logistical effort to get ourselves and all our equipment to the field site from

US McMurdo Station. The distance was about 2,000 km, so people and kit had to first go by C-130 transport aircraft to an intermediary hub – WAIS Divide Camp. There, we sorted the cargo into smaller loads before continuing on to the field site via a small fuel and cargo depot, flying on a mix of US and UK Twin Otter aircraft. Located so close to the grounding line, the area is heavily crevassed, and radar satellite imagery had indicated that the area might be too dangerous to work. Fortunately, an advance site safety team reported that most of the crevasses were thickly bridged and safe to travel over.

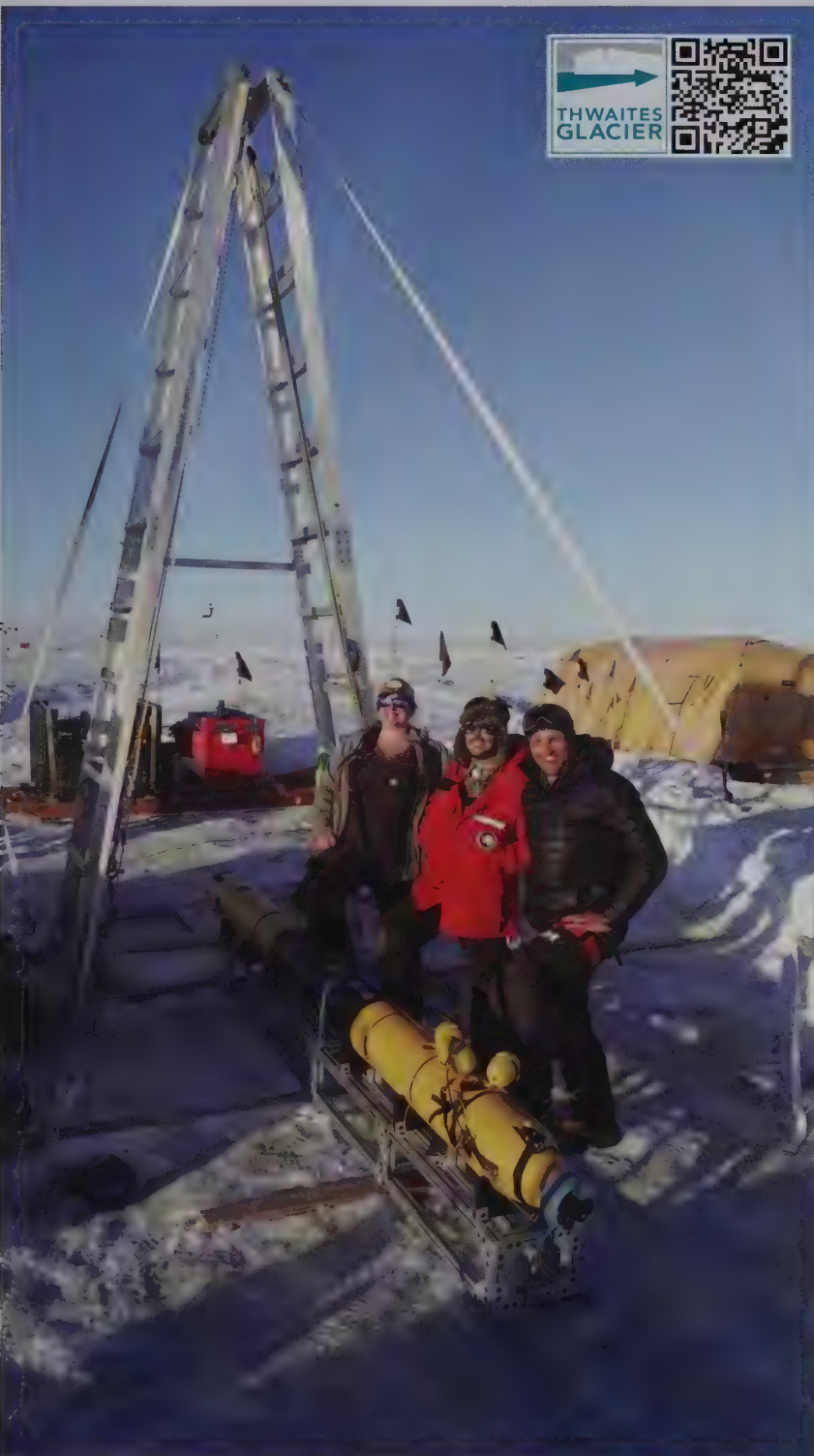
Named MELT, ours is one of eight field-based projects that are part of the International Thwaites Glacier Collaboration (ITGC). The principal agencies funding the study are the National Science

*A storm interrupts operations*

Foundation (NSF) in the US and the UK's Natural Environment Research Council (NERC). The ITGC effort was sparked by satellite data, which showed that the glaciers in Antarctica's Amundsen Sea region are not only losing ice into the ocean, contributing directly to global sea level rise, but that the process is also accelerating.

Thwaites Glacier is the giant in the region. At 130 km across, an area larger than Florida, it is the widest glacier on the planet. It is up to 3,000 meters thick, and at its fastest pace, it flows at 2 km each year. As it is, Thwaites contributes 4% of global sea-level rise annually, but researchers want to know how the glacier is likely to behave in the future. Estimates

*Thwaites Glacier contributes 4% of global sea-level rise annually, but researchers want to know how the glacier is likely to behave in the future.*



The Georgia Tech, Icefin team, prior to Icefin's first deployment.

of the glacier's potential contribution to sea-level rise by the year 2100 vary wildly, and could be over 0.65 meters in the event

of a total collapse. Because estimate figures are calculated based on computer modeling, the models need to incorporate the most current field observations to improve their accuracy.

While the floating ice shelf impedes the glacier's flow, it is its thinning that generates the acceleration of ice loss, which drives sea-level rise. As the glacier thins, the grounding line – the boundary along which a grounded glacier becomes a floating ice shelf – retreats inland. That retreat, in turn, exposes more of the ice base to melting, and further thinning leads to even more ice loss. Depending on the slope of the bedrock, this process can ultimately lead to runaway instability, which likely cannot be stopped.

The key uncertainty is the pace at which the ocean melts the base of the ice shelf at the grounding line. In order to teach computer models how to calculate those melt rates, the necessary data needs to be obtained. Only then could the models be able to accurately predict the glacier's evolution in a future changing climate. It was with this goal in mind that the MELT team traveled to the Thwaites ice shelf in January. The vitally needed measurements would be collected by boring a hole to the ocean beneath the glacier – through the shelf – using a hot-water drill.

The drill itself consists of a flexible water container capable of holding 10 tons of water, an electric water pump that forces 85 liters per minute through five 130 kW diesel-powered burners, which heat the water to 85°C, and a 700-meter long hose that conducts the hot water through a nozzle that is slowly lowered as the ice melts. Straightforward as this process may seem, it comes with the challenge of water recovery. By using a borehole pump that is inserted through an auxiliary hole to a depth of 80 m, the melt water can effectively be recycled, reheated and reused. In the case of the Thwaites ice shelf, it took approximately 24 hours to create a wide-enough borehole through the 600 meters of ice.

One of the exciting innovations in the

MELT project was the use of Georgia Tech's *Icefin* remotely-operated vehicle (ROV). Equipped with cameras, oceanographic sensors, and various echo sounders, including a multi-beam swath sounder, *Icefin* had been designed for exploration of the ocean cavities beneath ice shelves. Prior to the MELT project, it had only been deployed directly through sea ice, but because its range is determined by the length of its fiber-optic tether (up to 2 km), by working through the borehole, we were able to apply all of these capabilities to closely study the areas near the grounding line.

*Icefin*'s missions have provided a fascinating insight into the processes taking place in this extraordinarily remote part of the ocean, showing large amounts of sediment and rock debris at the base of the ice in certain areas, and a debris-free base in others. In some locations, the ice base was flat and glassy smooth; elsewhere it had steps several meters tall.

The borehole was kept open for about 48 hours, with *IceFin* carrying out five missions, each about three hours long. Between

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*Finally, before the borehole froze closed, an instrument package was carefully lowered into position just beneath the ice base. As they continuously collect, store and telemeter back vital turbulence data and information on variations in velocity, temperature and salinity of the water, these instruments will remain in place over the coming year.*

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missions (while the batteries were being recharged, and the operators getting some sleep), we carried out other research activities. We obtained a sequence of hydrographic profiles, which revealed how much properties vary with depth throughout the 50-meter deep water column within an ocean cavity. Additionally, using a lowered profiler from New York University, we performed a study of the turbulence in the water column – a key factor in the circulation of ocean heat near the ice base, which causes it to melt; and we collected sediment samples from the sea floor.

Finally, before the borehole froze closed, an instrument package was carefully lowered into position just beneath the ice

base. As they continuously collect, store and telemeter back vital turbulence data and information on variations in velocity, temperature and salinity of the water, these instruments will remain in place over the coming year.

Another borehole was drilled 2.6 km upstream of the first, in the grounded ice. This site will pass across the grounding line during the next year. Other instruments embedded in the ice column itself will monitor the distortion of the glacier as it transitions from ground frictional drag to no drag at all once it is afloat.

*Ten tons of water are needed to start the drilling process.*

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Courtesy of: Keith Nicholls and David Holland - co-PI of MELT project

Still other monitoring equipment was secured to the ice surface. It will measure how quickly the ice is deforming, and how rapidly the ocean is melting the ice base. When these data are coupled with the ocean measurements from the instrument package, we will have a hugely improved understanding of how the ocean melts an ice shelf near a grounding line.

In total, ten instruments will need to be dug up and retrieved next field season. Because of the high snowfall in this region, each hole will probably need to be well over two meters deep to access the instruments. That's a lot of digging! It's common knowledge in the Antarctic fieldwork community that a key requirement of an Antarctic researcher is to be good – very good – with a shovel.

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**Keith Nicholls** is a researcher at the British Antarctic Survey. He has spent the last 30 years studying the interaction between ice shelves and the coastal seas in which they float, and has published widely on the subject. He has pioneered the use of many different observational techniques, several of which have been utilized in the Thwaites-MELT project. Over the course of his career, Nicholls spent over two years under canvas carrying out fieldwork, mainly in Antarctica. He was awarded the Polar Medal in 2003.

**David Holland** is a professor of Mathematics at the Courant Institute at New York University (NYU). His research focuses on understanding mechanisms by which significant sea-level change could arise from the great ice sheets, Greenland and Antarctica, over the coming decades. He applies advanced applied mathematical techniques to data collected in remote environments. A veteran of more than a decade of Greenland and Antarctic field expeditions, Holland continues to spend summer seasons collecting vital information about the state of the glaciers in those regions. This data analysis is used to improve computer modeling of the interaction of the great ice sheets with



*Drill nozzle about to be lowered to widen the borehole.*

warming global ocean waters leading to more robust projections of global sea-level change. He has published more than 100 peer-reviewed articles on polar environmental science, and was selected for an NSF Career Award in 2000. He served as Director of the Center for Atmosphere-Ocean Science in the Courant Institute during 2008-2013 and since then he has become the Director of the Center for Sea Level Change at NYU, New York and Abu Dhabi.

### Relevant links for MELT:

<https://thwaitesglacier.org/projects/melt>

<https://www.bas.ac.uk/>

<https://nyuad.nyu.edu/cslc>

<https://www.bbc.com/news/science-environment-51097309>

<https://www.pbs.org/newshour/show/visiting-the-most-vulnerable-place-on-earth-the-doomsday-glacier>

@HotWaterOnIce

FLORIAN LEDOUX

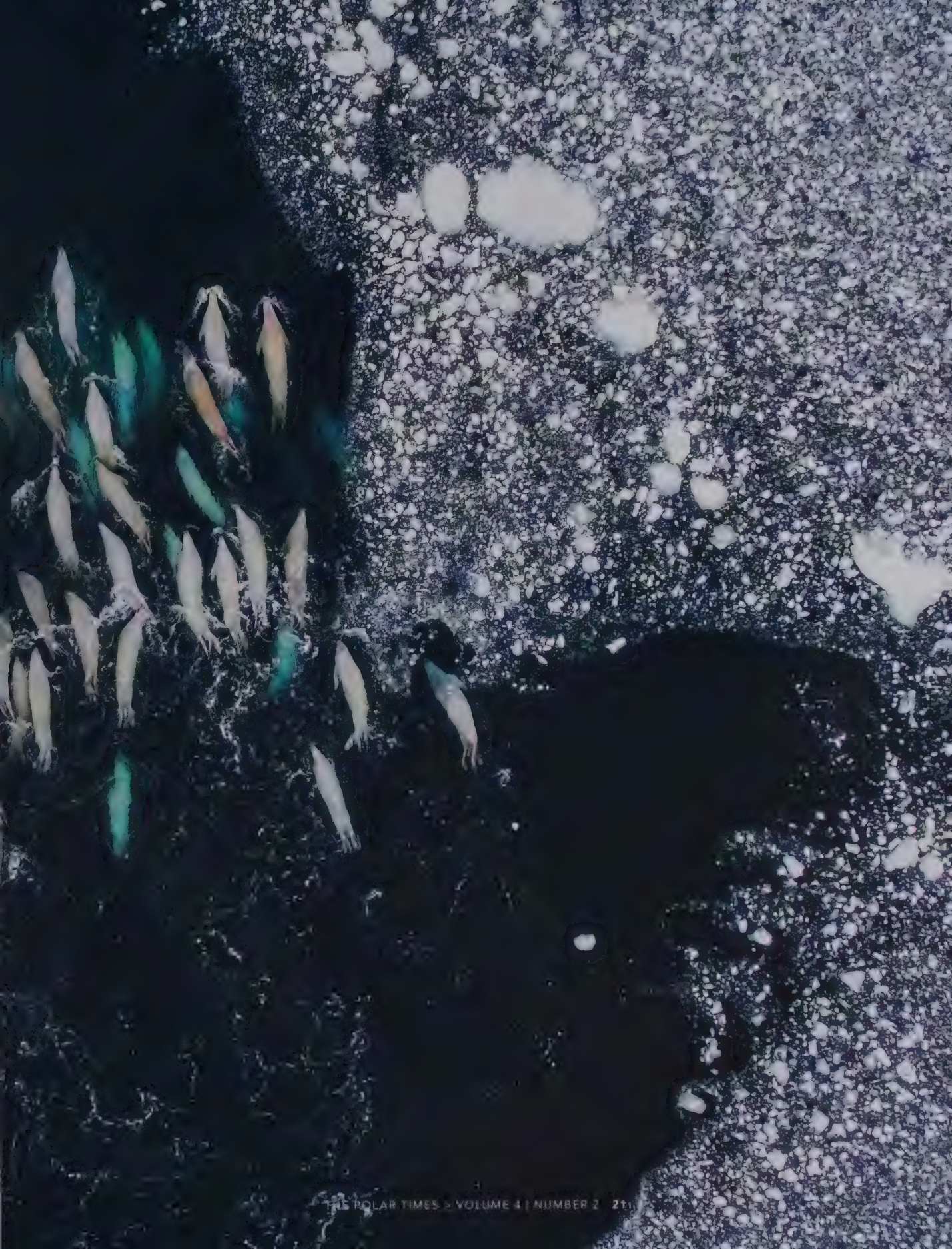
2020 NATURE TTL PHOTOGRAPHER OF THE YEAR

# Witness, Document and Protect

*A vocal conservationist, Florian Ledoux aims to use his photographic work as a vehicle to promote conscientious stewardship of Earth's Polar Regions.*

Pod of crabeater seals, seen from above feeding on krill at the edge of broken ice along the Antarctic Peninsula.

© Florian Ledoux



## FLORIAN LEDOUX – 2020 NATURE TTL PHOTOGRAPHER OF THE YEAR

by Florian Ledoux

**BOTH THE ARCTIC AND THE ANTARCTIC** are facing a series of rapid changes. While these hostile regions are a difficult place to live, animals have adapted to the extreme temperatures and strong winds of harsh winters. My photos seek to reveal and celebrate the beauty of the incredible fauna living on the edge of the ice, both powerful and yet so fragile.

Part of my work is based on aerial images. I aspire and hope to bring a new perspective on the fauna that we already know through traditional photography. I am convinced that these images allow us to observe and document their behavior from a new approach and angle, revealing the animals in their entirety, as well as in a larger habitat and landscape, in a way never before possible. It is a new way of learning about the vast white territories of the North and South of our planet.

### About Florian Ledoux

Recognized for his dynamic drone-based aerial imagery, Florian is an award-winning wildlife photographer working in the Polar Regions. His passion for wild landscapes and the animals that inhabit them led him to pursue personal projects and his dream of documenting the Polar Regions after serving as a photojournalist with the French Navy.

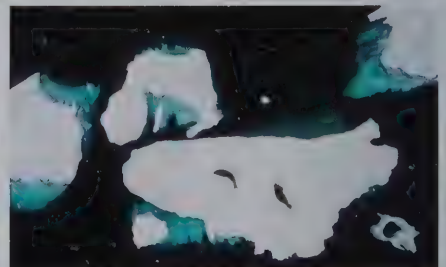
His work has been published in magazines including *National Geographic*, *Time*, *Géo*, *Oceanographic UK*, *National Geographic Traveler*, *Le Figaro*, and *Paris Match*, and has been exhibited in China, the United States, United Arab Emirates, Singapore, Italy, Canada and Russia. He was also awarded the Grand Prize for Drone Photography in 2017, and voted Drone Photographer of the Year 2018.

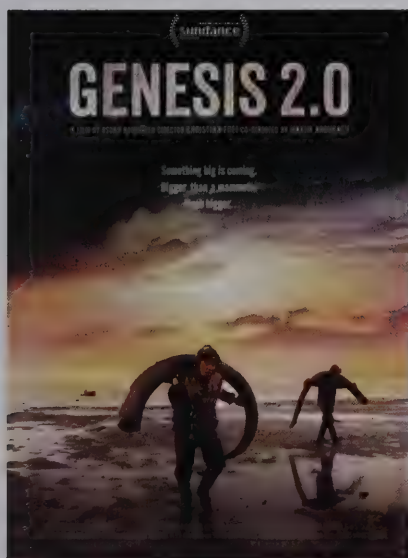
Florian's commitment to create mean-

ingful images is recognized by intergovernmental agencies and conservation organizations such as the International Union for the Conservation of Nature, the Arctic Council, and the Nature Conservancy. He believes that photography and video are powerful tools that can recon-

nect humans with nature, and that the use of drones provides a unique opportunity to showcase a wider habitat. His ultimate mission is to raise awareness of nature's fragility in the face of a changing climate.

Use your QR-code reader to read more about Florian Ledoux's wildlife photography.





## Film Synopsis

The film observes the harsh and dangerous life of so-called mammoth hunters on the remote New Siberian Islands in the far north of Siberia. The archaic landscape in which these people are looking for the tusks of extinct mammoths looks like primordial Earth. There is a kind of gold rush fever in the air, because the prices for this white gold have never been so high. But the thawing permafrost unveils more than just precious ivory. Sometimes the hunters find an almost completely preserved mammoth carcass with fur, liquid blood and muscle tissue on which arctic foxes gnaw. Such finds are magnets for high-tech Russian and South Korean clone researchers in search of mammoth cells with the greatest possible degree of intact DNA. Their mission could be part of a science-fiction plot. They want to bring the extinct woolly mammoth back to life à la "Jurassic Park", and resurrect it as a species. And that's just the beginning. Worldwide, biologists are working on re-inventing life. They want to learn the language of nature and create life following the Lego principle. The goal of synthetic biology is to produce complete artificial biological systems. Man becomes the Creator. The resurrection of the mammoth is a first track and manifestation of this next great technological revolution. An exercise. A multi-million dollar game. The

## GENESIS 2.0

A film by Oscar® nominated director Christian Frei. Co-directed by Maxim Arbugaev. Featuring: Peter Grigoriev, Semyon Grigoriev, George Church, Spira Slepsov, Woo Suk Hwang

new technology may well turn the world as we know it completely on its head...and all of this has its origin in the unstoppable thawing permafrost at the extreme edge of Siberia.

At the beginning and the end of the film, a female voice recites a Yakutian epic tale called "Olonkho – Eles Bootur."

### "Olonkho – Eles Bootur"

See here... See here...

Broad-shouldered you are!

But stupid you are.

Stout enough you are

but light-minded you are.

Fatuous and boasting you are!

But gazing at you I see

...no doubt...

you look well indeed!

You really came from Yakutia!

How did you manage

to set free that terrible devil?

Since when did he become

your bosom friend?

It was too late to catch him.

At the pass to a plentiful land.

At the passage to a windy world.

At the trampled down mouth

of a bottomless abyss.

In November 2005, UNESCO declared Olonkho "a masterpiece of the oral and intangible heritage of humanity." The Yakut heroic epos Olonkho is on the federal list of 100 books recommended for extracurricular reading. Olonkho is an ancient epic tale of the Yakuts. Olonkho poems consist of 10,000 to 15,000 lines and are performed by story-tellers.

### On Christian Frei's *Genesis 2.0*

by Livia Bloom Ingram

"Are you sure this is skin?" a man wonders, digging a greyish mass from the frozen tundra. He's part of a small party of pros-

pectors combing the New Siberian Islands, a desolate wintry archipelago, in search of unblemished mammoth tusks buried beneath the snow. Rising global temperatures and melting permafrost increasingly expose the giant ivory bones to searchers such as the scrappy band profiled in Christian Frei's haunting film *Genesis 2.0* (2018). A large flawless tusk might fetch between \$45,000 and \$90,000—not nearly the million dollars it might command after it has been cleaned and carved into an ornate sculpture, but enough money to change the fortunes of one man and his family. Enough money to make him risk frigid waters, claustrophobic caves, and the bad luck predicted for those who disturb an ancient mammoth's remains. Enough money to make him put his life on the line. But it's not a tusk that this man just might hold in his gloved hand, it's something rarer still: a piece of mammoth flesh, accompanied by a trickle of ancient black-red blood that spreads to stain the surrounding snow. And it's not the dream of a pricey piece of artwork that this find will inspire, but a genetically regenerated, living, breathing beast cloned from the frozen mammoth's DNA. *Genesis 2.0* finds Frei again working with cinematographer Peter Indergand, and adds a new collaborator: co-director Maxim Arbugaev, a young Yakutian filmmaker raised in the nearby Arctic port of Tiksi, who captures breathtaking footage on the New Siberian Islands. Together, they suffuse the film with luminous grey light and a palpable air of foreboding. Their eerie visual style evokes Cormac McCarthy's post apocalyptic novel (and John Hillcoat's 2009 screen adaptation) *The Road*; it also harkens to journalistic traditions such as Sven Zellner's documentary on rogue Mongolian gold miners, *Price of Gold* (2012). Musically, Frei has previously collaborated with minimalist composers including Arvo Pärt and Steve Reich as



Expedition group. Source: News.Ykt.Ru – (© from personal archive of Maxim Abugaev; used by permission from Christian Frei).

well as jazz musicians like Jan Garbarek; for *Genesis 2.0*, Max Richter and Edward Artemyev's score adds a deeply melancholy, hypnotic atmosphere. The geography of *Genesis 2.0* is not limited to the Arctic. Frei also brings viewers to the quirky Russian museum where a life-size mammoth figurine is carefully being vacuumed for visitors; the halls of a Synthetic Biology science conference in Boston where eager students work on genetic hybrids that just might save the world; China's National GeneBank, operated by the Beijing Genomics Institute (BGI), where genes are sequenced and "life becomes big data;" and the corporate campus of Soom Biotech in South Korea, where scientists – who have already cloned hundreds of pets – take life into their own hands. Over the course of the film, such disparate settings grow to comprise a map where humans – motivated by a poisonous blend of ambition, obsession, and desperation – are working determinedly to, as one scientist puts it, "make God perfect."

Frei's characters share their hubris in defying the laws of nature with an illustrious line of literary and cinematic forebearers, from Biblical parables and Greek myths to legends of contemporary cinema. Werner Herzog's menagerie of protagonists lead the pack; think of would-be Alaskan bear king Timothy Treadwell (*Grizzly Man*, 2005) or would-be Amazonian conquistador Lope de Aguirre (unforgettably embodied by the equally unhinged Klaus Kinski in *Aguirre, the Wrath of God*, 1972). At the same time,

*Genesis 2.0* adds a complex new chapter to Frei's own deeply thoughtful ongoing exploration of income inequality, rendered stark by high-stakes circumstance. In *Space Tourists* (2009), for example, he documents self-funded astronauts risking their lives (for science), alongside poor rocket detritus scavengers risking their lives (to earn a living). In *War Photographer* (2001), he profiles photojournalist James Nachtwey risking his life (to document the ravages of war), juxtaposed with Nachtwey's vulnerable, impoverished subjects, like one Indonesian family living between railway ties. To what lengths do the least fortunate among us go to support themselves and their children? To what lengths do the most fortunate among us go to justify their privilege? In each case, as in *Genesis 2.0*, Frei focuses his keen eye on the bounds of the possible, the reasonable, the safe and the sane. Those pushing at the limits are smart and brave, but there's a profoundly ominous undercurrent at play. When the man wonders whether he's found mammoth skin, we can only hope he's wrong.

## Filmmaker's Notes

by Christian Frei - Director, Producer, and Editor

Ever since its existence mankind has alternated between two strategies. We vacillate between reason and legend, rationale and demonization, logos and myth. Things get interesting when we are faced with something new, something for which we have no

rule of thumb, something that we don't comprehend. The consequence is curiosity or resistance, the desire to understand or fear.

*Genesis 2.0* takes the viewer into an unknown and exotic world, one that has little in common with our own daily life. This makes for a great cinematic experience. For a while we have no idea what these men are looking for. We don't know what drives them or who they are. Slowly we realize that they are in a kind of gold rush. We learn about their dreams, hopes and fears while we see the mundane reality and the struggle for survival.

But once we find our bearings and feel a little more comfortable we are thrown into an even more unknown, even more exotic world. All of a sudden these cloning folks enter the picture. Eventually we learn of their plans with the mammoth. And again we alternate between curiosity and resistance, between wanting to understand and wanting to demonize.

This is the central idea behind this film.

The film lures the viewers into an archaic world and then surprises them with a subject of the future. It deals with legends, myths and taboos and confronts us with our own fear of an unknown future. In an interesting way it invites us to get to know and to understand what are seemingly incompatible realms of thought, behavior and assessment.

All the while the film follows the mammoth and the people that are somehow connected to it. Their hopes, conflicts and hardships drive the film. It is not the film's aspiration to dissect the future technology 'Synthetic Biology' or to explain it in its entire complexity. It aspires to create interesting cinematic encounters with very different people, with the mammoth as the common denominator. In the end it wants to tell a story about our past, present and future - an entertaining and surprising story that inspires us to want to understand the new and unknown.

The film treats all protagonist with the same respect, regardless of their visions and



Semyon Grigoriev visiting the "Gene Museum" of the BGI Human Genome Center (film still).

goals, even when their plans and intentions seem absurd and scary or too Science Fiction. The film approaches everything with a curious skepticism. It asks questions and doesn't condemn. It tries to comprehend the new and the strange without being gullible. Utopia and dystopia, curiosity and skepticism - these are the main conflicts of our film. And its main drive.

## Filmmaker's Notes

by Maxim Arbugaev - Co-director and Cinematographer *New Siberian Islands*

When I came for the first time to the Islands with my sister Evgenia, I was 21 years old. During 15 years of my young life, I was playing professional ice hockey. Very intensively. When I came to the Islands, I just finished with my sports career. Something very important had changed inside me. And when we finally left the Islands, I was a different human being. The energy on the Islands has something catalytic.

Whilst shooting on the Islands, I become part of the mammoth hunters "family". Together we travel from North to South, in our "treasure" search and passing hundreds of kilometers in the vastness of the endless tundra. I live with the hunters as an equal. I am so happy to feel the respect of these men. They have welcomed me in their closed community. And I hope it shows in my footage how much I am accepted.

This is such a remote place. One of the things I immensely enjoy is the notion of being cut-off from civilization. I am feeling like in the books I read about the first explorers of New Siberian archipelago centuries ago. They had no communication with the rest of the world for long time... for months and sometimes years. This is not so much different today. Kesha, the head of the hunters group, is using a sat phone. And I have one just for emergencies. The hunters are allowed to call their families only in extremely rare occasions. They may use these treasured minutes only for important occasions, like birthdays or other not-to-be-missed family days. And the conversation may only last 4-5 minutes. Just enough to say that they are alive and all is good. These minutes are so precious! Somehow, the Islands are still cut off from the outside world.

The remoteness of the Islands is expressed through the difficulties I am facing to connect with Christian. My old Iridium sat phone does not allow me to connect to the Internet easily. We are exchanging sort of letters, which are being read in a voice-over. Christian and I share our thoughts and feelings. I tell what the Islands do with me. Christian tells

what visits to the labs do with him. We both agree that we use only as little voice-over as necessary and that the film remains mainly purely observational.

Hunters are the native people of the North, who practice shamanism and believe in spirits of nature. They are very careful and superstitious in their approach to these uninhabited islands. They are only guests here, spirits are always watching them. The land can be kind to them and let them find the tusks one day, and the next it can be brutal and destroy them. They realize their vulnerability and they are fearful to do the wrong step. We see the Arctic as a living creature of its own with mighty incomprehensible powers.

Before the "tusk rush," these people and their ancestors were hunters and fishermen. Tusk hunters have been brought up in a culture where you are allowed to kill animals only in the amount you need to feed your family; otherwise the spirits will avenge you for the greed.

This philosophy is now applied to the mammoth tusk hunt. Spira, one of our protagonists, lost his friend on the Islands. His friend died here four years ago. Spira says in his interview: "When I feel that I gathered enough tusks, I stop. I know that I have to pay the price for every tusk, maybe not now, but when I come back home, you never know when it will hit you. Sometimes the price of the tusk is a human life. Sometimes you pay for the tusks with your blood."

Use your QR-code reader to connect to the film trailer.



# WORLD WAR III'S NEWEST BATTLEFIELD

## U.S. Troops Head for the Far North

by Michael T. Klare

TomDispatch.com

IN EARLY MARCH, an estimated 7,500 American combat troops will travel to Norway to join thousands of soldiers from other NATO countries in a massive mock battle with imagined invading forces from Russia. In this futuristic simulated engagement—it goes by the name of Exercise Cold Response 2020—allied forces will “conduct multinational joint exercises with a high-intensity combat scenario in demanding winter conditions,” or so claims the Norwegian military anyway. At first glance, this may look like any other NATO training exercise, but think again. There’s nothing ordinary about Cold Response 2020. As a start, it’s being staged above the Arctic Circle, far from any previous traditional NATO battlefield, and it raises to a new level the possibility of a great-power conflict that might end in a nuclear exchange and mutual annihilation. Welcome, in other words, to World War III’s newest battlefield.

*Unbeknownst to most Americans, the Finnmark region of Norway and adjacent Russian territory have become one of the most likely battlegrounds for the first use of nuclear weapons in any future NATO-Russian conflict.*

For the soldiers participating in the exercise, the potentially thermonuclear dimensions of Cold Response 2020 may not be obvious. At its start, Marines from the United States and the United Kingdom will practice massive amphibious landings along Norway’s coastline, much as they do in similar exercises elsewhere in the world. Once ashore, however, the scenario becomes ever more distinctive. After collecting tanks and other heavy weaponry “prepositioned” in caves in Norway’s interior, the Marines will proceed toward the

country’s far-northern Finnmark region to help Norwegian forces stave off Russian forces supposedly pouring across the border. From then on, the two sides will engage in—to use current Pentagon terminology—high-intensity combat operations under Arctic conditions (a type of warfare not seen on such a scale since World War II).

And that’s just the beginning. Unbeknownst to most Americans, the Finnmark region of Norway and adjacent Russian territory have become one of the most likely battlegrounds for the first use of nuclear weapons in any future NATO-Russian conflict. Because Moscow has concentrated a significant part of its nuclear retaliatory capability on the Kola Peninsula, a remote stretch of land abutting northern Norway—any U.S.-NATO success in actual combat with Russian forces near that territory would endanger a significant part of Russia’s nuclear arsenal and so might precipitate the early use of such munitions. Even a simulated victory—the predictable result of

Cold Response 2020—will undoubtedly set Russia’s nuclear controllers on edge.

To appreciate just how risky any NATO-Russian clash in Norway’s far north would be, consider the region’s geography and the strategic factors that have led Russia to concentrate so much military power there. And all of this, by the way, will be playing out in the context of another existential danger: climate change. The melting of the Arctic ice cap and the accelerated exploitation of Arctic resources are lending this area ever greater strategic significance.

## Energy Extraction in the Far North

Look at any map of Europe and you’ll note that Scandinavia widens as it heads southward into the most heavily populated parts of Denmark, Finland, Norway, and Sweden. As you head north, however, it narrows and becomes ever less populated. At its extreme northern reaches, only a thin band of Norway juts east to touch Russia’s Kola Peninsula. To the north, the Barents Sea, an offshoot of the Arctic Ocean, bounds them both. This remote region—approximately 800 miles from Oslo and 900 miles from Moscow—has, in recent years, become a vortex of economic and military activity.

Once prized as a source of vital minerals, especially nickel, iron ore, and phosphates, this remote area is now the center of extensive oil and natural gas extraction. With temperatures rising in the Arctic twice as fast as anywhere else on the planet and sea ice retreating ever farther north every year, offshore fossil-fuel exploration has become increasingly viable. As a result, large reserves of oil and natural gas—the very fuels whose combustion is responsible for those rising temperatures—have been discovered beneath the Barents Sea and both countries are seeking to exploit those deposits. Norway has taken the lead, establishing at Hammerfest in Finnmark the world’s first plant above the Arctic Circle to export liquified natural gas. In a similar fashion, Russia has initiated efforts to exploit the mammoth Shtokman gas field in its sector of the Barents Sea, though it has yet to bring such plans to fruition.

For Russia, even more significant oil and gas prospects lie further east in the Kara and Pechora Seas and on the Yamal Peninsula, a slender extension of Siberia. Its energy companies have, in fact, already begun producing oil at the Prirazlomnoye field in the Pechora Sea and the Novoporo-



LNG site at dusk, on Melkøya, an island off Hammerfest, in Norway's Finnmark region. (Andreas Rumpel, CC BY-SA 3.0, Wikimedia Commons)

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*The exploitation of Arctic oil and gas resources and their transport to markets in Europe and Asia has become a major economic priority for Moscow as its hydrocarbon reserves below the Arctic Circle begin to dry up.*

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tovskeye field on that peninsula (and natural gas there as well). Such fields hold great promise for Russia, which exhibits all the characteristics of a petro-state, but there's one huge problem: the only practical way to get that output to market is via specially-designed icebreaker-tankers sent through the Barents Sea past northern Norway.

The exploitation of Arctic oil and gas resources and their transport to markets in Europe and Asia has become a major economic priority for Moscow as its hydrocarbon reserves below the Arctic Circle begin to dry up. Despite calls at home for greater economic diversity, President Vladimir Putin's regime continues to insist on the centrality of hydrocarbon production to the country's economic future. In that context, production in the Arctic has become an essential national objective, which, in turn, requires assured access to the Atlantic

Ocean via the Barents Sea and Norway's offshore waters. Think of that waterway as vital to Russia's energy economy in the way the Strait of Hormuz, connecting the Persian Gulf to the Indian Ocean, is to the Saudis and other regional fossil-fuel producers.

### The Military Dimension

No less than Russia's giant energy firms, its navy must be able to enter the Atlantic via the Barents Sea and northern Norway. Aside from its Baltic and Black Sea ports, accessible to the Atlantic only via passageways easily obstructed by NATO, the sole Russian harbor with unfettered access to the Atlantic Ocean is at Murmansk on the Kola Peninsula. Not surprisingly then, that port is also the headquarters for Russia's Northern Fleet—its most powerful—and the site of numerous air, infantry, missile, and radar bases along with naval shipyards

and nuclear reactors. In other words, it's among the most sensitive military regions in Russia today.

Given all this, President Putin has substantially rebuilt that very fleet, which fell into disrepair after the collapse of the Soviet Union, equipping it with some of the country's most advanced warships. In 2018, according to *The Military Balance*, a publication of the International Institute for Strategic Studies, it already possessed the largest number of modern cruisers and destroyers (10) of any Russian fleet, along with 22 attack submarines and numerous support vessels. Also in the Murmansk area are dozens of advanced MiG fighter planes and a wide assortment of anti-aircraft defense systems. Finally, as 2019 ended, Russian military officials indicated for the first time that they had deployed to the Arctic the Kinzhal air-launched ballistic missile, a weapon capable of hypersonic velocities (more than five times the speed of sound), again presumably to a base in

the Murmansk region just 125 miles from Norway's Finnmark, the site of the upcoming NATO exercise.

More significant yet is the way Moscow has been strengthening its nuclear forces in the region. Like the United States, Russia maintains a "triad" of nuclear delivery systems, including intercontinental ballistic missiles (ICBMs), long-range "heavy" bombers, and submarine-launched ballistic missiles (SLBMs). Under the terms of the New Strategic Arms Reduction Treaty (New START), signed by the two countries in 2010, the Russians can deploy no more than 700 delivery systems capable of carrying no more than 1,550 warheads. (That pact will, however, expire in February 2021 unless the two sides agree to an extension, which appears increasingly unlikely in the age of Trump.) According to the Arms Control Association, the Russians are currently believed to be deploying the warheads they are allowed under New START on 66 heavy bombers, 286 ICBMs, and 12 submarines with 160 SLBMs. Eight of those nuclear-armed subs are, in fact, assigned to the Northern Fleet, which means about 110 missiles with as many as 500 warheads—the exact numbers remain shrouded in secrecy—are deployed in the Murmansk area.

For Russian nuclear strategists, such nuclear-armed submarines are considered the most "survivable" of the country's retaliatory systems. In the event of a nuclear exchange with the United States, the country's heavy bombers and ICBMs could prove relatively vulnerable to preemptive strikes as their locations are known and can be targeted by American bombs and missiles with near-pinpoint accuracy. Those subs, however, can leave Murmansk and disappear into the wide Atlantic Ocean at the onset of any crisis and so presumably remain hidden from U.S. spying eyes. To do so, however, requires that they pass through the Barents Sea, avoiding the NATO forces lurking nearby. For Moscow, in other words, the very possibility of deterring a U.S. nuclear strike hinges on its ability to defend its naval stronghold in Murmansk, while maneuver-



Norwegian forces during the military exercise Cold Response 2009. (Wikimedia Commons)

ing its submarines past Norway's Finnmark region. No wonder, then, that this area has assumed enormous strategic importance for Russian military planners—and the upcoming Cold Response 2020 is sure to prove challenging to them.

## Washington's Arctic Buildup

During the Cold War era, Washington viewed the Arctic as a significant strategic arena and constructed a string of military bases across the region. Their main aim: to intercept Soviet bombers and missiles crossing the North Pole on their way to targets in North America. After the Soviet Union imploded in 1991, Washington abandoned many of those bases. Now, however, with the Pentagon once again identifying "great power competition" with Russia and China as the defining characteristic of the present strategic environment, many of those bases are being reoccupied and new ones established. Once again, the Arctic is being viewed as a potential site of conflict with Russia and, as a result, U.S. forces are being readied for possible combat there.

Secretary of State Mike Pompeo was the first official to explain this new strategic outlook at the Arctic Forum in Finland last May. In his address, a kind of "Pompeo Doctrine," he indicated that the United States was shifting from benign neglect of the region to aggressive involvement and militarization. "We're entering a new age of strategic engagement in the Arctic," he insisted,

"complete with new threats to the Arctic and its real estate, and to all of our interests in that region." To better protect those interests against Russia's military buildup there, "we are fortifying America's security and diplomatic presence in the area... hosting military exercises, strengthening our force presence, rebuilding our icebreaker fleet, expanding Coast Guard funding, and creating a new senior military post for Arctic Affairs inside of our own military."

The Pentagon has been unwilling to provide many details, but a close reading of the military press suggests that this activity has been particularly focused on northern Norway and adjacent waters. To begin with, the Marine Corps has established a permanent presence in that country, the first time foreign forces have been stationed there since German troops occupied it during World War II. A detachment of about 330 Marines were initially deployed near the port of Trondheim in 2017, presumably to help guard nearby caves that contain hundreds of U.S. tanks and combat vehicles. Two years later, a similarly sized group was then dispatched to the Troms region above the Arctic Circle and far closer to the Russian border.

From the Russian perspective, even more threatening is the construction of a U.S. radar station on the Norwegian island of Vardø about 40 miles from the Kola Peninsula. To be operated in conjunction with the

Norwegian intelligence service, the focus of the facility will evidently be to snoop on those Russian missile-carrying submarines, assumedly in order to target them and take them out in the earliest stages of any conflict. That Moscow fears just such an outcome is evident from the mock attack it staged on the Vardø facility in 2018, sending 11 Su-24 supersonic bombers on a direct path toward the island. (They turned aside at the last moment.) It has also moved a surface-to-surface missile battery to a spot just 40 miles from Vardø.

In addition, in August 2018, the U.S. Navy decided to reactivate the previously decommissioned Second Fleet in the North Atlantic. “A new Second Fleet increases our strategic flexibility to respond—from the Eastern Seaboard to the Barents Sea,” said Chief of Naval Operations John Richardson at the time. As last year ended, that fleet was declared fully operational.

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*In the event of a nuclear exchange with the United States, the country's heavy bombers and ICBMs could prove relatively vulnerable to preemptive strikes as their locations are known and can be targeted by American bombs and missiles with near-pinpoint accuracy.*

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## Deciphering Cold Response 2020

Exercise Cold Response 2020 must be viewed in the context of all these developments. Few details about the thinking behind the upcoming war games have been made public, but it's not hard to imagine what at least part of the scenario might be like: a U.S.-Russian clash of some sort leading to Russian attacks aimed at seizing that radar station at Vardø and Norway's defense headquarters at Bodø on the country's northwestern coast. The invading troops will be slowed but not stopped by Norwegian forces (and those U.S. Marines stationed in the area), while thousands of reinforcements from NATO bases elsewhere in Europe begin to pour in. Eventually, of course, the tide will turn and the Russians will be forced back.

No matter what the official scenario is like, however, for Pentagon planners the situation will go far beyond this. Any Russian assault on critical Norwegian military facilities would presumably be preceded by intense air and missile bombardment and the forward deployment of major naval vessels. This, in turn, would prompt comparable moves by the U.S. and NATO, probably resulting in violent encounters and the loss of major assets on all sides. In the process, Russia's key nuclear retaliatory forces would be at risk and quickly placed on high alert with senior officers operating in hair-trigger mode. Any misstep might then lead to what humanity has feared since August 1945: a nuclear apocalypse on Planet Earth.

There is no way to know to what degree such considerations are incorporated into the classified versions of the Cold Response 2020 scenario, but it's unlikely that they're missing. Indeed, a 2016 version of the exer-

cise involved the participation of three B-52 nuclear bombers from the U.S. Strategic Air Command, indicating that the American military is keenly aware of the escalatory risks of any large-scale U.S.-Russian encounter in the Arctic.

In short, what might otherwise seem like a routine training exercise in a distant part of the world is actually part of an emerging U.S. strategy to overpower Russia in a critical defensive zone, an approach that could easily result in nuclear war. The Russians are, of course, well aware of this and so will undoubtedly be watching Cold Response 2020 with genuine trepidation. Their fears are understandable—but we should all be concerned about a strategy that seemingly embodies such a high risk of future escalation.

Ever since the Soviets acquired nuclear weapons of their own in 1949, strategists

have wondered how and where an all-out nuclear war—World War III—would break out. At one time, that incendiary scenario was believed most likely to involve a clash over the divided city of Berlin or along the East-West border in Germany. After the Cold War, however, fears of such a deadly encounter evaporated and few gave much thought to such possibilities. Looking forward today, however, the prospect of a catastrophic World War III is again becoming all too imaginable and this time, it appears, an incident in the Arctic could prove the spark for Armageddon.



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Professor of Peace and World Security Studies, a joint appointment at Amherst, Hampshire, Mount Holyoke, and Smith Colleges and the University of Massachusetts, Amherst. He now serves as a Senior Visiting Fellow at the Arms Control Association in Washington, D.C.

Klare has written widely on international peace and security issues, arms control and disarmament, and global resource politics. He is the author of fifteen books, including, most recently, *Resource Wars* (2001), *Blood and Oil* (2005), and *The Race for What's Left* (2012), and *All Hell Breaking Loose: Climate Change, Global Chaos, and American National Security* (2019). He is also the Defense Correspondent of *The Nation* and has written for many other journals, including *Arms Control Today*, *Current History*, *Foreign Affairs*, *Harper's*, *Le Monde Diplomatique*, *Newsweek*, *Scientific American*, and *Technology Review*.

Klare earned a B.A. and M.A. from Columbia University in 1963 and 1968 respectively and a Ph.D. from the Graduate School of the Union Institute in 1976.

*The views expressed are solely those of the author.  
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## Floating Coast: An Environmental History of the Bering Strait

By Bathsheba Demuth

Publisher: W. W. Norton & Company. A Best Book of the Year as chosen by *Nature*, *Kirkus Reviews*, and *Library Journal*.



A groundbreaking exploration of the relationship between capitalism, communism, and Arctic ecology since the dawn of the industrial age.

Whales and walrus, caribou and fox, gold and oil: through the stories of these animals and resources, Bathsheba Demuth reveals how people have turned ecological wealth in a remote region into economic growth and state power for more than 150 years.

The first-ever comprehensive history of Beringia, the Arctic land and waters stretching from Russia to Canada, *Floating Coast* breaks away from familiar narratives to provide a fresh and fascinating perspective on an overlooked landscape. The unforgiving territory along the Bering Strait had long been home to humans—the Inupiat and Yupik in Alaska, and the Yupik and Chukchi in Russia—before Americans and Europeans arrived with revolutionary ideas for progress. Rapidly, these frigid lands and waters became the site of an ongoing experiment: How, under conditions of extreme scarcity, would the great modern ideologies of capitalism and communism control and manage the resources they craved?

Drawing on her own experience living with and interviewing indigenous people in the region, as well as from archival sources, Demuth shows how the social, the political, and the environmental clashed in this liminal space. Through the lens of the natural world, she views human life and economics as fun-

damentally about cycles of energy, bringing a fresh and visionary spin to the writing of human history.

*Floating Coast* is a profoundly resonant tale of the dynamic changes and unforeseen consequences that immense human needs and ambitions have brought, and will continue to bring, to a finite planet.

## The Big Thaw: Ancient Carbon, Modern Science, and a Race to Save the World

By Dr. Robert Max Holmes, Dr. Sue Natali, and Dr. John Schade, with Eric Scigliano. Photography by Chris Linder. Published by Braided River, the conservation imprint of Mountaineers Books, an independent nonprofit publisher.

In the race to counter the climate crisis, accurate information is critical to finding solutions. The earth is heating as human activity sends more carbon dioxide into the atmosphere, but in the calculations scientists use to predict the pace of change, one huge piece of the puzzle hasn't been factored in until now—the massive amount of carbon locked in the Arctic's frozen soils, known as permafrost.

Scientists at Woods Hole Research Center are working hard to fill that gap by studying the Arctic's rapidly thawing permafrost and the resulting impact on the estimated 1,200 to 1,850 billion tonnes of stored carbon. This "big thaw" has the potential to greatly accelerate global climate change. Featuring engaging photographs from award-winning science and natural history photographer Chris Linder, *The Big Thaw* takes you to the research sites of Woods Hole Research Center's unique Polaris Project—located first in Cherskiy, Siberia and recently on Alaska's remote Yukon-Kuskokwim Delta. Led by Drs. Robert Max Holmes, Susan Natali, and John Schade, this project's goal is to find out how quickly the permafrost is thawing and what its impact will be, but also to encourage a

new generation of scientists to imagine innovative solutions to global problems.

Both warning and inspiration, *The Big Thaw* takes an unflinching look at the threats we face in a warming world, but also captures the undaunted spirit of the diverse team of scientists and students who are racing against the clock to save not only the Arctic but all the natural systems on which our lives depend.



## The Polar Adventures of a Rich American Dame – A Life of Louise Arner Boyd



By Joanna Kafarowski. Published by Dundurn. The first comprehensive biography of Louise Arner Boyd—the intrepid

American socialite who reinvented herself as the leading female polar explorer of the twentieth century.

Born in the late 1880s to a gritty mining magnate who made his millions in the California gold rush and a well-bred mother descended from one of New York's distinguished families, society beauty Louise Arner Boyd was raised during a glittering era.

After inheriting a staggering family fortune, she began leading a double life. She fell under the spell of the north in the late 1920s after a sailing excursion to the Arctic Ocean. Over the next three decades, she achieved international notoriety as a rugged and audacious polar explorer while maintaining her flamboyant lifestyle as a leading society woman. Yet despite organizing, financing, and directing seven daring Arctic expeditions between 1926 and 1955, she is virtually unknown today.

## Adventures in Polar Reading: the Book Cultures of High Latitudes

Authors: David H. Stam; Deirdre Corcoran



Stam

Publisher: The  
Grolier Club, 2019

Based in part on  
his own naval  
experience, includ-  
ing duty in Antarc-  
tica, and informed  
by extensive archi-  
val and secondary  
research, David

Stam's book examines the printed needs of several polar expeditions, including those of Adolphus Greely in the International Polar Year 1881-83 in northernmost Canada. Stam's study also includes analysis of shipboard- and expedition-based periodicals throughout the so-called Heroic Age of exploration (ca. 1880-1921); a definitive essay on the enduring books of Ernest Shackleton's legendary journey aboard the *Endurance*; a parallel study of the primarily religious literature distributed as Loan Libraries of the American Seamen's Friend Society; and, finally, an account of the three libraries assembled by Richard Evelyn Byrd for the successive bases at Little America (1929-41). The volume is bookended by chapters that provide an autobiographical account of how *Adventures in Polar Reading* came to be written and extensive suggestions pointing the way to topics of research that Stam's methodology might enable for other scholars.

### BOOK REVIEW

## China as a Polar Great Power

By Anne-Marie Brady

(Woodrow Wilson Center Press and  
Cambridge University Press, 2017, 273pp,  
\$29.99 paperback)

Reviewed by Jeff Rubin

"A new international order is emerging, and

the polar regions offer front row seats to observe this changing geopolitics," asserts Anne-Marie Brady in her important new study, the result of ten years' "academic detective work."

Brady is a professor of politics and international relations at the University of Canterbury in New Zealand and a Global Fellow at the Woodrow Wilson Center in Washington, D.C. She is also editor-in-chief of *The Polar Journal*, a biannual publication founded in 2011 that examines polar issues from a social science and humanities perspective.

She began looking at China and Antarctica in 2006 when colleagues in New Zealand told her, "China is spending a lot of money there, and we don't know why."

Brady's fact-filled book is well-written and revelatory. It deserves a wide audience, for anyone interested in the future of either polar region will find it both instructive and interesting.

China's rise as a polar power has been "dramatic and rapid," Brady says (for details, see her chapter on China in 2013's *The Emerging Politics of Antarctica*, reviewed in *The Polar Times*' January 2014 issue).

Thanks to its booming economy, Brady explains, China "is uniquely able to expand rapidly in Antarctica at a time when other leading states are cutting back or barely maintaining their Antarctic programs." The United States' polar capacity, meanwhile, "is steadily slipping backwards."

Dramatic though it has been, China's increased activity in the polar regions has "flown under the radar—until this book," Brady says, partially as a result of academic specialization, but mainly due to the barriers of language and the Chinese government's deliberate program of hiding its interests in the polar regions.

Brady used Chinese-language primary sources, classified policy papers, discussion documents, and interviews, as well as sources in English and other languages

# CHINA

AS A POLAR GREAT POWER



ANNE-MARIE BRADY

to write the first scholarly study in any language, she says, of "the range of China's polar interests and current government policy, their possible effects on other polar players, and their potential position in China's growing global role."

"Polar great power" is not a phrase heard widely in the West, but China uses it to categorize its aspirations and to emphasize the significance of the polar regions to its national interests.

What are China's interests in the polar regions?

Resources.

The Chinese Communist Party's equation for maintaining its privileged position over Chinese society is simple, Brady says: "access to resources will sustain economic development, which in turn will underwrite political stability."

Since 2005, "when China began its 'Great Leap' in polar capacity expansion," Brady says, "China's polar policymakers have framed the polar regions as a 'treasure chest' of mineral resources and deemphasized environmental values when communicating with Chinese audiences." She adds: "In the polar regions, as elsewhere, China

prioritizes development first and environmental protection second."

Yet China hides its full polar agenda from foreign audiences, knowing that revealing it would "lead to even more international resistance toward its polar interests." China tries hard to create an image of itself as peaceful and cooperative in order to prevent international opinion from turning against its plans in the polar regions.

China does this in part by sending different messages to its domestic audience and foreigners. According to two of the country's leading polar policymakers, since at least 1989, China's polar foreign policy has been: "understand the status quo, be proactive, hide our strengths and bide our time."

Thus when President Xi Jinping, China's most powerful leader in decades, gave a speech on 18 November 2014 while visiting the icebreaker *Xue Long* in port in Hobart, Australia, two official texts were released.

In the English language account on the website of the Chinese Ministry of Foreign Affairs, Xi said: "The Chinese side stands ready to continuously work with Australia and the international community to better understand, protect and exploit the Antarctic."

The state-run *China Daily* newspaper, however, translated it as "protect and explore Antarctica."

As Brady points out, it's "an extremely serious matter" to change the words of the senior leader in China, but as *China Daily* editors are well aware, Chinese polar officials "scrupulously avoid mentioning China's strong interest in exploiting polar resources, whereas in Chinese-language materials it is continually highlighted as the main reason for China's investment in polar activities."

She adds: "The assumption is that foreigners will not be able to read Chinese, and so they will not know what Chinese officials and commentators are saying in

IN 2010, YIN ZHUO, A RETIRED SENIOR NAVAL OFFICER AND AUTHORIZED PEOPLE'S LIBERATION ARMY (PLA) SPOKESMAN, STATED BALDLY: "CHINA'S POPULATION ACCOUNTS FOR ONE-FIFTH OF THE WORLD'S POPULATION, SO WHY SHOULDN'T WE GET A FIFTH OF THE INTERESTS IN THE ANTARCTIC AND ARCTIC?"

Chinese about the polar regions — and mostly, they are right."

In 2010, Yin Zhuo, a retired senior naval officer and authorized People's Liberation Army (PLA) spokesman, stated baldly: "China's population accounts for one-fifth of the world's population, so why shouldn't we get a fifth of the interests in the Antarctic and Arctic?"

Despite the international furor caused by these remarks, the 2013 and 2014 annual reports on China's polar policy, Brady says, "both emphasized that access to the considerable natural resources at the two poles was essential for the continued growth of the Chinese economy."

Making clear the focus of the country's polar interests, the State Oceanic Administration (SOA) which sets China's polar agenda (not the Ministry of Foreign Affairs), is under the direct control of the powerful Ministry of Land and Natural Resources.

China's focus on becoming a 'polar great power,' Brady says, "represents a fundamental reorientation — a completely new way of looking at the world." Nothing represents this better than Hao Xiaoguang's "vertical world map" shown on the cover of this book.

China is at the center, "visually dominating the Asia-Pacific," while "sidelining" the United States, shown upside-down at the edge of the map.

Used since 2004 by the SOA to chart its voyages to the Arctic and Antarctic,

and since 2006 by the People's Liberation Army (PLA) as an official military map, it was released to the public only in 2014.

How is China being "proactive" about pushing for its interests within the status quo?

The example of Antarctica is revealing, Brady says.

The Antarctic Treaty's Protocol on Environmental Protection, which China signed, entered into force in 1998. Although it prohibits mineral exploration and exploitation, it does not specify what is "exploration" and what is "scientific research," allowing each country to do as it pleases.

Further, "each nation with a research station in Antarctica acts as if its bases are sovereign territory and applies its national laws there," an accepted international norm for half a century. This means, Brady says, "that the more scientific bases and work sites a nation has in Antarctica, the more *de facto* control their government has over territory there."

China "retains the right to establish a territorial claim in Antarctica," like Russia and the U.S., but unlike Russia and the U.S., China has no history of Antarctic exploration. It also failed to make its position on Antarctic sovereignty known at the time of the signing of the Antarctic Treaty in 1959 so its claim of potential sovereign rights violates the Treaty.

China has been particularly active since 1998 in a part of East Antarctica claimed

by Australia. During the International Polar Year (IPY) of 2008-9, Chinese documents labelled a region of East Antarctica "PANDA," standing for Prydz Bay, Amery Ice Shelf and Dome A, the site of China's astronomical observatory at the highest point of the polar plateau.

Chinese scientists call the traverse route from the coastal Zhongshan station up to Dome A "China Boulevard," while Chinese officials proudly and regularly refer to this massive area as "China's Management District" and "China's Great Wall."

But China wants to do more than just name this slice of the continent.

Beginning in 2013, it proposed an enormous Antarctic Specially Managed Area (ASMA) surrounding Kunlun, the station it opened at Dome A in 2009. At 19,764 square km, it would be Antarctica's largest.

Believing that China is attempting to cre-

ate this ASMA as a way to control the area and unfairly exclude other nations from it, the other Antarctic Treaty countries have rejected the proposal five times (in 2013, 2014, 2015, 2016 and 2017) — to China's great annoyance.

During the 2015 Antarctic Treaty meeting, one Chinese delegate to the Committee on Environmental Protection "thumped on the table and in harsh tones demanded that China's request be met," a rare and unseemly display.

Meanwhile, China opposes the creation of Marine Protected Areas (MPAs) around Antarctica because they would restrict the activities of its fishing fleet, the world's largest.

China is unlikely, Brady says, to directly oppose existing international laws and norms or try to change them. But when it comes to international laws and norms that

do not suit China's interests, "China will go around them or ignore them."

Using the Chinese proverb "Kill the chicken to scare the monkeys," Brady says China has shown itself willing to do more than merely work around obstructions, however. Its bullying and isolation of Norway from 2010 to 2017, after the Nobel Peace Prize was awarded to Chinese dissident Liu Xiaobo, she says, "was done not only to punish Norway but to set an example for other states of the consequences of publicly displeasing Beijing."

Because Brady's chapters appear to have been written as separate essays, often for publication elsewhere, there's a certain amount of overlap and repetition. But this also means each can be read individually and separately.

The final 10 pages serve as a concise summary — or a useful introduction.

## MUSIC

# SYMPHONY ANTARCTICA

Album by Valmar Kurol and Michael Stibor

THE MUSIC ON THIS ALBUM continues a 25-year interest in Antarctica that began with my first visit in 1993 as a tourist and continued through four more trips to the Antarctic Peninsula, the Ross Sea area and along the coast of Western Antarctica. While it may be easier to

develop music for particular locations or events, much of the music on this album is based on broader themes related to the continent. The three movements include 1) musical interpretations of Antarctica's seasons in "The Seasons," 2) the exploration of outer space from the South Pole in "Telescopes to the Stars" and 3) a portrayal of the unseen under-ice Lake Vostok, and of the lava lake inside Mt. Erebus, Antarctica's active volcano in "Icescapes" and "Landscapes."

This project would not have been possible without the compositional and keyboard wizardry of my musical collaborator, Michael Stibor — thank you, Mike.

— Valmar Kurol, Montreal, Canada, July 2019

This album represents a year and a half's worth of dedication, hard work, and musical collaboration with Valmar. Our goal was to write music that would not only provide the listener with a sense of time and place, but at the same time to tell musical stories that would transport the listener to faraway places not easily, or often, reached. I am extremely pleased and honoured to share this music with you.

— Michael Stibor, Montreal, Canada, July 2019

Visit website for streaming or purchase:  
<https://www.symphonyantarctica.com/>



## The Book That Never Was: A Lost Polar Classic—Rediscovered

by Sheldon Bart

Imagine if a book had been written documenting the most significant outing in the transition from the “heroic” to the “scientific” era of polar exploration. Imagine if that epic had been authored by a participant with an inside knowledge of the proceedings.

Well, such a book exists, more or less, and it has been lost for more than 80 years!

One of Admiral Richard E. Byrd’s closest and most colorful associates, George O. “Rex” Noville was third-in-command of Byrd’s North Pole expedition (1926); fuel engineer, radio operator and relief pilot of the Byrd transatlantic flight (1927); and executive officer of the second Byrd Antarctic Expedition (1933-1935). He wrote a major account of the second Antarctic expedition serialized in a bygone pulp magazine. To the best of my knowledge, the installments have never been compiled in book form or referenced by any previous researcher.

### About Noville

George O. Noville (1890–1963), was a bright, witty guy. He enlisted in the Navy after graduating high school and showed such promise he was immediately sent to Columbia University to study aeronautical engineering. He was commissioned in the Naval Air Service in 1916, flew combat missions over the Italian front during the First World War, and, after the Armistice, pioneered the airmail service both as pilot and superintendent. Noville invented the technique Byrd and other polar aviators used to warm and start their engines in frigid temperatures. He was also an incorrigible womanizer and binge drinker, but went on the wagon for the duration of the second Byrd Antarctic expedition (BAE II), surprising a lot of people, including himself. I’ve read a bunch of his casual writings (radiograms for instance), and have always felt that if he had had the discipline to sit down and write a book about BAE II, it would have been the



best in all of polar literature. Here was a man who, for example, said:

*“The bottom of the world is exactly what the name implies.”*

*“Next Christmas, I’ll have my ice in a glass.”*

*“This place is colder than my last reception on Park Avenue.”*

*“After this, I should qualify as an excellent Frigidaire salesman, but would insist on the Death Valley territory.”*

*“I always keep my old promises or make new ones.”*

Turns out he did write a book, sort of. In 1936, he produced for Argosy magazine a running account of BAE II in 25 consecutive weekly installments beginning with the January 18, 1936 issue.

I’ve only seen a small part of it—the New York Public Library has a spotty collection of Argosy. But what I’ve read is vivid, detailed, exciting and funny—just what I would expect from Noville.

The series was entitled: *White Adventure* by Lt. Cmdr. George O. Noville, USNR as told to Thomas Calvert McClary.

A frequent contributor to the pulp magazines of the 1930s, 40s and 50s, McClary wrote short stories and serialized novels in the science-fiction and western genres. He and Noville worked well together; Noville’s voice and sense of humor was preserved throughout the installments of *White Adventure* that I’ve seen. McClary died in 1972.

A complete collection of Argosy magazine is available at Ohio State University.

### About BAE II

Noville didn’t accompany Byrd on the first Antarctic expedition (1928–1930) only because he was employed as a sales executive by Standard Oil of California, and Standard had been supplanted by Tidewater Oil as fuel supplier to the Byrd expeditions. Noville was given to understand that if he went to Antarctica with Byrd in 1928 he would no longer have a position with Standard. His second wife, Sigrid, a native New Yorker, however, did not adapt well to

life on the west coast. The Novilles moved back east in the early 1930s, and Rex was once again available for a leading role in a Byrd expedition.

And just in time. Following is an outline of some of the challenges and dilemmas faced by the second Byrd Antarctic Expedition:

**A New Model of Exploration** There was a polar exploration problem that remained to be solved: Aviators and surface explorers had to take everything they needed to survive on the ice to accomplish their missions. Airplanes could lift and dogs could haul only so much weight. These heavy loads limited the distances that could be covered and the work that could be done.

To resolve the weight problem Byrd added another element to the transportation system: tractors. Between the coast of Antarctica, where Byrd’s camp, Little America, was situated, and the mountains to the south was a 400-mile ice sheet, riddled with bottomless crevasses. Some were the size of city blocks, and many were camouflaged with a thin roof of snow. Byrd reasoned, correctly, that if the weight of the tractors could be reduced and the width of the treads widened, they would be able to negotiate this environment.

Dogs, planes, tractors. He had now created the model for the Antarctic exploration of the next half-century.

**Unprecedented Scale** With the help of Noville and others, Byrd put together some of the pieces of the most ambitious expedition he ever organized as a private citizen. He eventually managed to collect two ships, four planes, including an autogyro (part-airplane, part-helicopter), four tractors, one hundred men, one hundred and fifty dogs, hundreds of thousands of dollars worth of scientific instruments, a full stock of Hollywood movies (“Forty-Second Street,” “Blonde Venus,” etc.) and three prize cows to supply fresh milk. One of the cows was pregnant from the get-go and delivered a baby bull in the south polar seas.

He also brought a fully-equipped broadcasting studio to Little America. Byrd signed a contract with CBS to produce a radio pro-

gram live from Antarctica. The network aired the show on a weekly basis, with the popular "Burns & Allen" announcer, Harry Von Zell, hosting from a studio in New York.

The broadcast was sponsored by General Foods and attracted a national audience. Lincoln Ellsworth, who mounted a rival expedition during the same time frame, reached Antarctica by spending his father's money; Byrd did it by selling breakfast cereal en route.

**Byrd Luck** The second Antarctic expedition continually illustrated Murphy's law, everything going wrong that could. The icebreaker nearly foundered off the coast of North Carolina; the dogs came down with a virus; the aerial surveyor left in a huff, leaving an inexperienced photographer; a new type of propeller, potentially an aeronautic breakthrough, turned out to be unreliable; the flagship, in dense fog, nearly smashed into an iceberg the size of Manhattan Island; the expedition physician proved to be an alcoholic and had to be replaced; the ice shelf Byrd landed on four years earlier was no longer a smooth surface but a treacherous badlands through which a new and longer trail had to be hacked out. Even worse, cracks appeared in the ice around Little America, suggesting that the compound itself float out to sea on the roof of an incipient glacier.

These calamities and near-disasters were averted with skill, determination and what the expedition members called "Byrd Luck." But the Admiral's luck was about to run out.

**Advance Base** The second Antarctic expedition was also the occasion for Byrd's self-isolation at Advance Base, a weather observa-

tion station he occupied alone, through the winter night, 123 miles from Little America. The "station" consisted of a tiny hut buried beneath the surface to make use of snow's insulating properties. A gasoline-burning generator was provided to power a short-wave radio; there was an oil-burning stove for heat and cooking, and an oil-burning lamp. The ventilation system was faulty; fumes from the generator, stove and lamp were trapped inside both hut and storage tunnels. As a result, Byrd almost died of carbon monoxide poisoning. His motives for going to Advance Base and the ramifications of leaving his command behind are still being debated today.

**The Controversial Rescue** Byrd created a chain of command at Little America, presided over by men like Noville with military backgrounds. Advance Base was scheduled to check in with the compound every few days by short-wave radio. Byrd could receive voice communications and send Morse code signals. Two civilians, chief scientist and second-in-command Thomas C. Poulter and journalist Charles J.V. Murphy, began to suspect that something was wrong when, at times, Byrd's code messages became erratic. Poulter proposed a late winter-early spring tractor journey to Advance Base, ostensibly to augment a series of meteor observations that had been conducted at Little America, but in reality to check on Byrd. The military men cautioned against the mission, reasoning that if a tractor embarked in the darkness, plunged into a crevasse and men died, Byrd would be ruined.

The proposed tractor journey created

a buzz throughout camp. The editors of the compound newspaper ran an editorial opposing the idea. A staff meeting was subsequently held to discuss the proposal. The men realized the historical significance of the issue they were called upon to debate and kept detailed minutes of the proceedings. The transcript clearly shows that they had no idea of Byrd's condition.

**An Intimate Account** Noville, as executive officer, was involved in all phases of BAE II operations and most especially the decision-making process concerning the proposed tractor journey. Further, when Byrd returned in a debilitated condition from Advance Base, Noville nursed the Admiral back to health. His intimate account would unquestionably provide historians and polar enthusiasts with a vital record of a landmark American enterprise.

The major hurdle to be surmounted would be the rights issue. Who owns the rights to Argosy? Does Noville have any heirs? Did McClary, the ghost writer, leave any heirs? If any *Polar Times* reader can contribute to the resolution of the rights issue or might be connected with a publishing house interested in bringing out a bound edition of *White Adventure*, please get in touch with me at wildresch@aol.com.

Polar pioneer, raconteur and all-around live wire Rex Noville ought to be back in print, where he deservedly belongs.

Sheldon Bart's most recent book is *Race to the Top of the World: Richard Byrd and the First Flight to the North Pole*.

## ERRATA

*"I need to offer a correction to Sheldon Bart's obit/tribute of Brian Shoemaker. It is true that Brian brought TPT back BUT it was I who was the bridge between August Howard and Brian when I was the Assistant Director of the Byrd Polar Research Center at Ohio State University. I also was the person who brought the Byrd Papers to OSU, as well as the Wilkins Papers, and*

*Bud Waites' papers to OSU."*

— Peter J. Anderson

The APS is grateful to Peter for both the above clarification and for his efforts in continuing the legacy of August Howard.

*"One comment I have is that the photo on the back cover was incorrectly labeled. That is a photo of the Atmospheric Research Observatory (ARO) that is in the clean air sector, not the Ice Cube Lab, which is in the dark sector."*

— (James) Dana Hrubec:

Thank you, Dana, for the correction.

## THE NOVEL GRAPHIC NOVEL

by Sarah Airriess

IT'S NOVEMBER 2009, and I am nibbling through breakfast in the splendid bar of the Algonquin Hotel in New York City. I am part of Disney Animation's publicity team for *The Princess and the Frog*, which is on early release here. At least, that is where my body is. The rest of me is in Antarctica, in a ramshackle stone igloo whose roof had blown off in hurricane-force winds, shivering in my reindeer-fur sleeping bag, and regretting I hadn't been a little more sinful prior to Death coming for me in the guise of sleep.

Last year at this time, I had been animating the movie I am here to promote, and in my usual diet of BBC radio plays was an adaptation of *The Worst Journey in the World*. In the blazing heat of a Californian autumn, I could not stop listening to it. I picked up a copy of the book, and here in New York, where I had no outside obligations and significant downtime between performances, I was finally getting stuck in.

IT SHOULD NOT HAVE BEEN SURPRISING THAT I SYMPATHIZED WITH APSLEY CHERRY-GARRARD. THE SURPRISE WAS THAT, FOR YEARS, THE STORY WOULD NOT LEAVE ME ALONE.

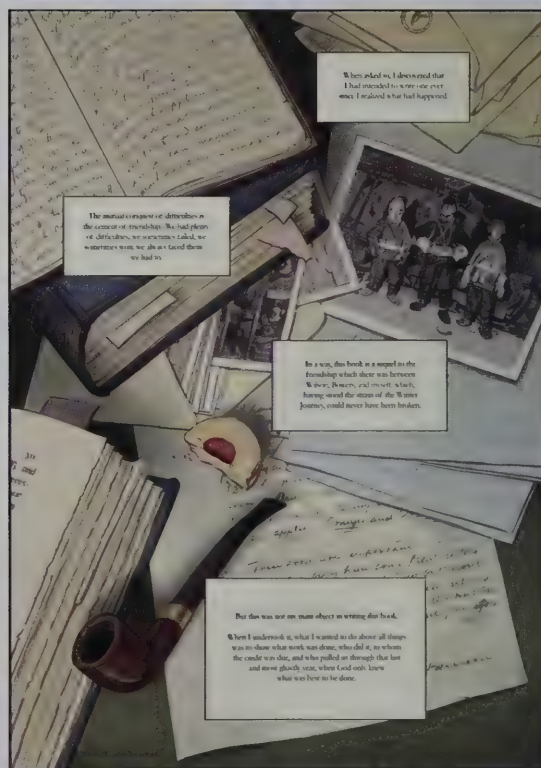
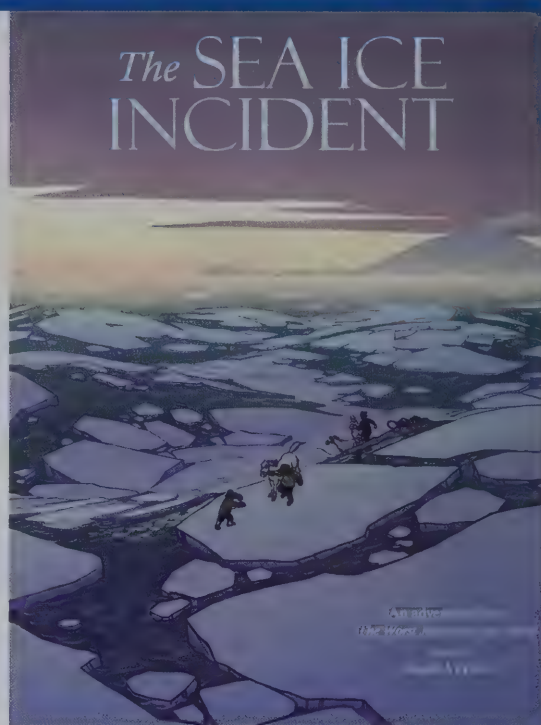
Exactly ten years later, I am crouched against a sill of igneous rock, buried inside an excessively puffy red parka, trying to hold my camera steady in a continuous 35-knot wind. When we left McMurdo, Cape Crozier was reporting 30% cloud cover and 7-knot winds. By the time the helicopter arrived, a heavy mist was descending and the wind had gone up to 30. On the way to the igloo, dodging precious rare lichen while trying not to be blown over, I passed an incongruous log of petrified wood. "How did it

get on this volcanic ridge?" I wondered, but the answer was obvious: *It had been blown here, of course!*

The decade between these two Novembers is either an inspiring story of creative passion, or a tale to warn children away from pursuing a career in the arts. My job at Disney had only just begun when I first heard that radio play, having been brought on board as part of a new generation of hand-drawing (2D) animators, with the intent of reviving a dying art form. I had always wanted to be a 2D animator. Getting inside a character's head, and bringing them to life through drawings, had been a compulsion my whole life. I graduated from animation school one

month after Disney had shut down its 2D department the first time, and was extraordinarily lucky to get in as a trainee when they resuracted it several years later.

When I started at Disney, I had no particular interest in polar exploration. I knew as much about the Terra Nova Expedition as most people do: that Scott's team came in second in the



TOP: Cover image for a short comic depicting the moment when the sea ice broke up under Bowers, Cherry-Garrard, and Crean's camp. ABOVE: A page from the prologue to Volume 1 of *The Worst Journey in the World*.



LEFT: Sarah's illustration of a party scouting Cape Crozier for a safe landing place. ABOVE: The foothills of Mt. Terror at Cape Crozier.

I WAS REPEATEDLY TOLD THAT ONE CANNOT PROPERLY UNDERSTAND ANTARCTICA UNTIL ONE HAS BEEN THERE, AND IN ORDER TO DEPICT THE STORY AS ACCURATELY AS I INTENDED TO, I HAD TO GO THERE.

race to the South Pole, and that they died on the way back. The radio play, however, followed not the polar party itself, but the people who were waiting for the party to return. The account is presented from the point of view of young Apsley Cherry-Garrard, who considered himself extraordinarily lucky to be a trainee zoologist on Scott's second journey to Antarctica. This brought a human dimension to the story. Suddenly they were real individuals with hopes, dreams, faults and strengths; men who loved and were loved. And they were wonderful.

It should not have been surprising that I sympathized with Cherry-Garrard. The surprise was that, for years, the story would not leave me alone. I kept reading more books about it. I began saving historical photos to my hard drive. I drew these people during meetings, on studio paperwork, and during pauses in life drawing class. I thought, "This would make an amazing graphic novel. Someone should



do it!" Yet, the centenary of the expedition came and went with no graphic novel. It began to dawn on me that perhaps I would have to do it. But I was an animator, not a comics artist! I would be crazy to leave my dream job for this!

But it hadn't been my dream job for a while. After *Winnie the Pooh*, Disney shut down its 2D again. I shuffled from one drawing project to another, but by then, I was disillusioned with the studio and the industry. In a crisis, I discovered that I was eligible for a UK visa, and decided I ought to at least make a go of this book. Even

if I'd failed, I would know that I'd given it a shot.

As soon as I stopped fighting the book, everything fell into place. I worked enough freelance jobs to get a solid footing in the UK, then went full-time on the book in 2016. There was a lot of research and development to be done; days and days in the Scott Polar Research Institute archives, designing the characters and amassing photo references for everything from a felt boot to the engine room of the *Terra Nova*.

Over tea breaks at SPRI, I was repeatedly told that one cannot properly understand Antarctica until one has been there, and in order to depict the story as accurately as I intended to, I had to go. In spring 2018, I applied for the National Science Foundation's [NSFs] Antarctic Artists & Writers Program grant, and spent most of 2019 juggling the book with various demands of the planning process, and medical qualification protocols, which seemed to go on forever. At last in November, I boarded a C-17 to McMurdo, and spent a month immersed in the landscapes I had explored in my imagination for so long. I was delighted to share the history of the place with people who called it home. The United States Antarctic Program [USAP] laid down the red carpet to get me wherever I needed to go. With their help, and unusually cooperative Antarctic weather, I saw everything I could realistically have seen. Any truth I achieve in the depiction of *The Worst Journey* is due to their abundant

A page from *The Sea Ice Incident*.

generosity. My project and I are forever in their debt.

But right now, my mind is focused on getting the necessary photos to place the Cape Crozier igloo in its proper context when I come to draw it in a few years' time. My camera battery doesn't like the cold, so I have to work quickly, and I worry I will omit an angle. Before long, my coordinator approaches and shouts from deep within her hood that we must depart – the pilot is worried about his helicopter in these high winds. The flight back is surreal as we float over crevasse fields and enormous

clouds of drift blowing over ice cliffs out to sea.

We left McMurdo for Cape Crozier at teatime and are back in time for dinner. The contrast with the agonizing five weeks that Cherry, Wilson, and Bowers spent

manhauling to Cape Crozier and back in the middle of winter is too great to comprehend. I find a table of friends in the Galley, and cushioned in their conversation, eat in silence. Once again, I am physically there, but inside am somewhere else entirely. Antarctica is inside me now, and I will take it home with me, to visit again every time I draw the story that brought me here. I hope I can do it justice.

To read more about animator and illustrator Sarah Airriess, and to become a patron, visit her *Patreon* page at [www.patreon.com/posts/interview-with-11663778](http://www.patreon.com/posts/interview-with-11663778)

For PDF format downloads of Sarah's comics, scan this QR code:



Ex-Disney animator brings Antarctic story to life



Please join the American Polar Society as we extend our best wishes and warm congratulations to Antarctic explorer

**Robert R. Johnson, Retired USN CPO**  
in celebration of his 100th birthday!

**Chief Boatswain's Mate Robert Rowland Johnson, USN (Retired)** will reach the century mark on July 7. Just before his 16<sup>th</sup> birthday, he sailed in the square-rigger *Pacific Queen* from San Diego with a crew of Sea Scouts, but the planned 15-day trip turned into a 68-day adventure. After high school Johnson enlisted in the Navy, and spent 18 months aboard the *USS Pennsylvania*, before joining the *USS Bear*, Admiral Byrd's flagship during the US Antarctic Service Expedition 1939-41. During World War II he was on convoy duty, worked at Pearl Harbor, and was also an instructor. Johnson returned to Antarctica as a member of the ice party with *Operation Highjump* (1946-47), and again in *Operation Windmill* (1947-48), where he was chief boatswain's mate in the *USS Burton Island*. Today, a point of land on the northeastern portion



of Horseshoe Island, Antarctica, has the official name Johnson Point.

– Glenn M. Stein, FRGS, FRCGS, May 23, 2020

Robert Johnson holds a photo of himself as a young man in the U.S. Navy Monday, May 16, 2011, at his home in Jacksonville, Florida. He took part in the third expedition to Antarctica of Admiral Richard Byrd in 1939, and then later trips to the Arctic and back to Antarctica.

Sarah Airriess's illustration of Wilson, Bowers, and Cherry-Garrard crossing Windless Bight on the Winter Journey to Cape Crozier.

BACK COVER: "Above the Crabeater Seals" – Antarctica  
© Florian Ledoux, Overall Winner, Wildlife category –  
2020 Nature TTL Photographer of the Year.

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